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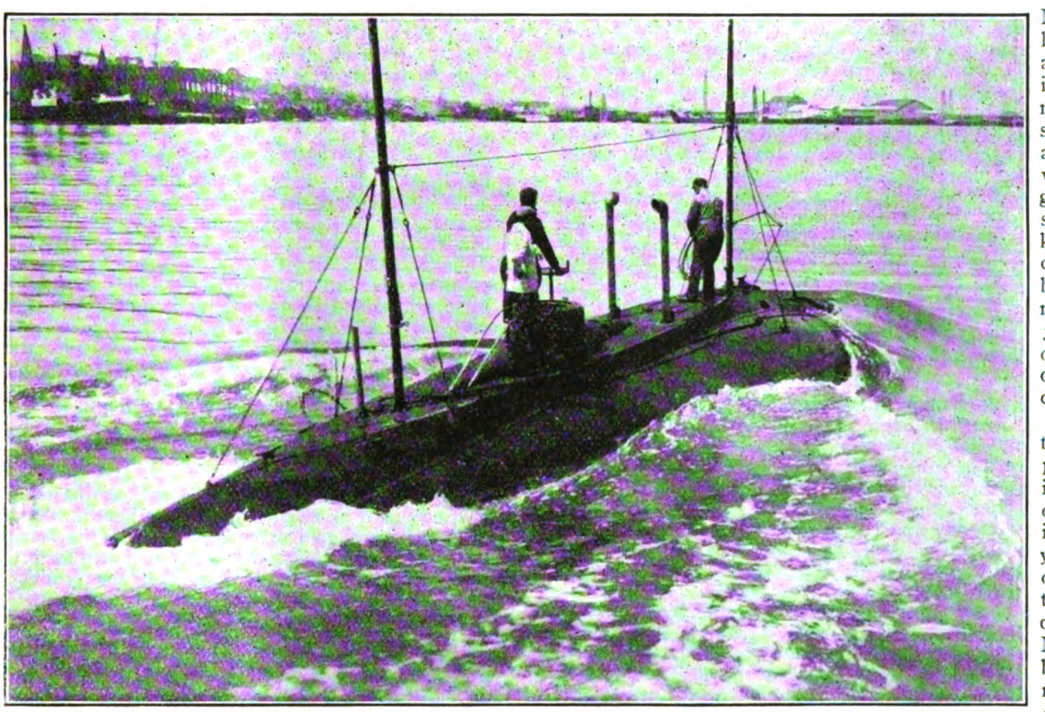
No. 10

HOW BRITONS VOTE SUBSIDIES.

As there seems to be much interest felt in the United States on the subject of American shipping, and a widespread desire to see American ships enjoying a greater share of our foreign carrying than the 8 per cent. they now carry, the manner in which Britons advance and protect their shipping interests cannot fail to attract attention. The fact has already been exploited in the columns of the Review that the British government has just made a contract with the Cunard Steamship Co. by which the latter will receive a loan of $13,000,000, at the rate of 2¾ per cent. interest to be applied to the building of two steamships that it is expected will attain the unheard of speed of 24½ knots an hour. In addition to this, the British government agrees to pay to the Cunard company $340,000 a year for carrying "the whole week's mail" from Great Britain to the United States; and, besides this, a flat sum of $750,000 annually, to run for twenty years, will be paid to the Cunard company by the British government as a plain, bald, unadulterated subsidy. There is a certain coterie of American newspapers that are rampant in their opposition to subsidies to American ships, and they let no opportunity pass to voice their horror and detestation of the principle and its application—to American ships. Payments to American ships for carrying the mails, and for the use of the vessels for auxiliary naval purposes, are characterized by this coterie of newspapers as "subsidies," and they are opposed to them. It is singular in the extreme that, almost without exception, this very same coterie of American newspapers commend the British-Cunard subsidies, and the haste with which they come to the defense of Great Britain and the Cunard company, whenever adverse criticism is made of the agreement in question, is still more singular. Whatever it is that prompts them to this persistent opposition to American subsidies and their equally persistent indorsement of British subsidies, may forever remain in the dark. Americans who have a loyal desire to see American ships secure a reasonable share of their own country's foreign carrying should at all times bear in mind the pro-British anti-American predilections of this section of the American press.



Submarine Torpedo Boat Grampus.

[Built by Union Iron Works, San Francisco.

The Review has obtained a recent copy of the London Times, which reported, in the English style, the debates in the British house of commons on the British-Cunard agreement, also, at the same time, the recently made agreement between the British government and the International Mercantile Marine Co. After Mr. Gerald Balfour had formally presented the agreements for the approval of the house of commons, Mr. E. Robertson, member from Dundee, started the ball a-rolling saying that "he took it that the present system of paying subsidies in time of peace, preparatory to hire or purchase in time of war, was abandoned; and that in substitution for that we were going to have a system whereby would be made in time of peace agreements for the hire or purchase of vessels in time of war." He thought, as did a great many Americans when it was announced that the subventions were to be abandoned after April 1, 1905, that thereafter no British subsidies whatever would be paid. The member from Dundee, however, was quickly undeceived. He had the grace to acknowledge the error of his views, saying, quoting the London Times:

"As regarded the Cunard agreement, he pointed out that the government were to make a loan of 2,600,000 pounds sterling to the company for the purpose of enabling it to build two ships of large dimensions. When these ships had been built we were going to pay the company a sort of rent or new kind of subsidy of 150,000 pounds sterling a year. What would be the financial effect of these proposals? The nominal capital value of the company was 1,600,000 pounds sterling, and their own valuation of their fleet was under 2,000,000 pounds sterling. Their shares at the present market value made the whole capital not more than 1,200,000 pounds sterling. To a concern of this kind we were going to make a loan of 2,600,000 pounds sterling—a million above the nominal capital value and about double the real capital value of the concern. The loan, moreover, was to be a loan of 2¾ per cent., and the difference between that rate and the rate of 5 per cent. which the company would otherwise have to pay was really equivalent to a bonus. By virtue of the payment of a balance of 15,000 pounds sterling a year the company would become the possessor of two of the most enormous vessels of modern times, with a capital value of 2,600,000 pounds sterling."

Of course, Mr. Robertson had more to ask the British government's representatives, and asserted that it was up to the government to show that 24½-knot cruisers could not be built by the admiralty for £1,300,000 apiece of less than 30,000 tons. He continued:

"It appeared that this new proposal was, in part at least, due to the panic created last year by the sudden creation of the Morgan combine. The Morgan combine did not now seem to be so formidable as it seemed to many people last year, and they are now able to sleep comfortably in their beds. But the arrangements of a non-naval character which were contained in the Cunard agreement appeared to him to be of a vague and sentimental character, less appropriate to a business transaction between the admiralty and the Cunard company than to an attempt to meet the supposed dangers of the Morgan combine."

There are a good many reasons why Great Britain gives subsidies to British ships, and the number of reasons increases as the apparent necessity for them arises; but that an American corporation, buying a number of British steamships, should cause her to subsidize a company is the most singular reason of all. Other members protested against an agreement being made with the Cunard company without first ascertaining by public competition the terms upon which the government requirements might be met by other companies.

Another distinguished Briton is quoted by the London Times as follows:

"Mr. Bryce said that this agreement was the result of what he must still call the panic of last year, caused by the great Morgan syndicate. Was there any cause for this alarm? The combination was not formed with any purpose of challenging our supremacy. It was purely a commercial operation, undertaken for purely commercial reasons, with no anti-British object. He must enter a protest against anything in the nature of subsidies; and he wished to know if this agreement was the beginning of a policy? A subsidy could only be justified where it was not a subsidy—that is to say, where it was payment for direct value received. Subsidies were interminable, because, once begun, it was impossible to say when they would stop; they were unfair to the unsubsidized steamers; they gave rise to lobbying, and to the intrusion of private influences into the political sphere; and they provoked counter subsidies in other countries. If this coun-

try began to give subsidies it was perfectly certain that the United States would beat us at it, and that congress would recall the policy which it had been inclined to drop."

Disregarding all of the arguments against subsidies in general and the Cunard Steamship Co.'s subsidy in particular, the agreement between the British government and the Cunard company was duly ratified by the British parliament after only a few hours' debate and without a division on the final vote. These are facts not to be disregarded by American advocates of protection for shipping when again assailed by the opposition.

PHILADELPHIA SHIP BUILDING NEWS.

Philadelphia, Sept. 2.—At Cramps ship yard, after plans prepared by Matteson & Blaxe, naval architects, barge No. 101, recently purchased by the Barrett Manufacturing Co. of New York, and brought to Philadelphia from Buffalo, will be converted into an oil tanker. Seven new bulkheads will be put in; the two aft ones forming a cofferdam. Steel flats, each 13 ft. long, will be put at each end of the cargo space, thus necessitating locating the pump room on the top of the aft flat. Aft the cofferdam a 100-H. P upright boiler will be put, to operate the oil and bilge pumps and deck hoist. The five bulkheads forward of the cofferdam will form five oil-tight tanks. Forward of the cargo space there will be considerable space for packages. The crews' quarters forward will be done away with and will be put aft so that the crew will have easy access to the pumps, boiler, etc. A new turret will be added to house the smoke stack and form an entrance to the pump room. The barge is to be equipped with two small pole spars, four lug sails and a Chase Machine Co.'s double cylinder steam deck hoist. The oil pump is piped to the various cargo tanks, with individual valves and suctions in each tank, and arranged so that the same cargo main can be used for loading or unloading, or for pumping from lighters and discharging into the tanks. It will require about two months' time to make the changes specified. Barge No. 101 is the first whaleback barge to be thus converted, although another whaleback, the City of Everett, was converted into a tanker in the winter of 1901-2 at Cramps for the Standard Oil Co. When ready for service Barge No. 101 will carry oil and coal tar and will ply between Norfolk, Baltimore and New England points with occasional trips to Texas.

Repairs to be made to the St. Paul, of the American Line now at the New York Ship Building Co.'s yard, will require fully two months' time. The vessel is to be given a thorough overhauling. The boilers of the Mallory Line steamer San Jacinto, launched at Roach's ship yard last week, are being made at the shops of the New York Ship Building Co. and comprise three double-end boilers, 16 ft. diameter by 18 ft. long, and two single boilers, 16 ft. diameter by 10.6 long. The second fire boat being constructed by the company for New York city will be ready for launching during the latter part of September. Work on the Manchuria, sister ship to the Mongolia, recently launched, is progressing satisfactorily and the time for launching is not far off. The new "steel pickling" building is virtually completed and in service and with its traveling crane and other machinery is a valuable addition to the company's growing plant.

A. F. Leonhardt and James W. Porch, of the New Orleans Board of Trade's committee interested in starting a new steamship line between Philadelphia and New Orleans, have been in Philadelphia for several days looking after the plan. The several boards and business men of Philadelphia have encouraged the success of the new plan and yesterday Mr. Porch, who is first vice-president of the New Orleans Board of Trade, said: "The line will be established, there is no question about that, and Philadelphia has met us favorably in the matter."

Drexel & Co., bankers, have given notice to the holders of the temporary voting trustees certificates of the William Cramp & Sons Ship & Engine Building Co. that they are ready to exchange for these the engraved voting trustee's certificates of stock. At the Cramp ship yards all hands are busy. Work on the three cruisers Colorado, Tennessee and Pennsylvania is progressing, as well as on the Turkish cruiser, Medjidie, and the steel tug for the harbor master of Philadelphia.

The H. R. Doerr Boat Co., which has a yard at East Camden, is fairly overrun with orders for launches. The company, of which H. R. Doerr is manager, is forging to the front in the boat building line and as soon as orders on hand will permit, extensive improvements are to be made looking to the building of larger craft.

The new steel tug Flemington, built at the Neafie & Levy ship yards, was taken over to New York last week by Capt. William Mumford and delivered to her owners, the Central Railroad of New Jersey.

The Pusey & Jones Co., Wilmington, delivered to the Delaware & Chesapeake Canal Co. last week a rebuilt barge, a dredge —one side of which was rebuilt, and the tug Reamer, overhauled and repaired.

The name of the steamer Hudson, of the Merchants' and Miners' Line, has been changed to Frederick.

Swan & Hunter, Wallsend-on-Tyne, have acquired the property of the Tyne Pontoons & Dock Co. Some time ago they amalgamated with the engine works of Wigham, Richardson, Ltd., so that now they probably have the largest and most self-contained ship building, engineering and repairing establishment in the United Kingdom.

CARNEGIE SAYS STEEL MUST ADVANCE.

The autumn conference of the Iron & Steel Institute of Great Britain opened at Barrow, England, this week under the presidency of Andrew Carnegie. Mr. Carnegie has the distinction of being the only man, not a citizen of Great Britain, to hold this office. In his address he said that the record of Great Britain in iron and steel making had not been equaled, although the United States is working miracles. Continuing he said:

"In all matters of iron and steel, however, the child has been borne upon the shoulders of the parent. If the Atlantic ocean had been prairie land, there would have been little left in the world but the conquering old woman and her family, all under one roof, under one flag, a self-sustaining empire under free trade with probably 200,000,000 of our English speaking race and a home market so big as to give control of neutral markets. No question of protection or preferential tariffs then to disturb us; beside all this, we should have been able to enforce peace among nations.

"Gentlemen, unfortunately, an ocean exists where we should have preferred prairies, but it is traversed in about the same time as the 3,000 miles of land between Montreal or New York on the Atlantic and San Francisco and Victoria on the Pacific. Who so bold as to predict that never is our race to succeed in converting the ocean, hitherto a barrier to your extension, into the pathway to reunion of the two once united branches. Not I. My faith is unshakable that some day this will be accomplished and that instead of being two small islands here alien to the European continent you will look across the sea to your own children in Canada and in the United States and become once more the mother member of the dominant power of the world."

He referred at length to a meeting of the institute held in Barrow twenty-nine years ago and then said:

"The work of a week is now done in a day, but great as that contrast, here is one still greater. There have been made and sold without loss hundreds of thousands of tons of 4-in. steel billets at three pounds for a penny. Surely, gentlemen, the limit has been reached here. I think it has, and it is doubtful if ever a lower price can be reached for steel. On the contrary, there is every indication that period after period the price of steel is to become dearer owing to the lack of raw materials. To make this 3 lbs. of steel at least 10 lbs. of material were required—3 lbs. of coke, mined and transported 60 miles to the works, 1½ lbs. of lime, mined and transported 150 miles, and 4½ lbs. of ironstone mined at Lake Superior, and transported 900 miles to Pittsburg, being transferred twice, once from cars into the ship, and again from the ship into the railway cars. How it was done, I cannot pretend to tell you, but I know the figures are correct. But every time I repeat them, I doubt their possibility. This was done during the day of depression, when everything was at the lowest. Costs are several dollars per ton higher today, during this period of boom in America.

"Gentlemen, such is the contrast between 1874 and 1902. What is it to be twenty-nine years hence? What changes are to come? I have tried to imagine some of its features. It is scarcely possible that this country can increase its product of iron and steel materially. Let us hope that the product will not be decreased. The vital element in the matter is, as we all know, the supply of iron ore. Many of you are conversant with the situation here. I only know what I learn from others, but undoubtedly the attention of the iron and steel manufacturers should be directed to this question. Where and how can they obtain a supply of iron ore?

"Nor is it a question which the manufacturer of America can safely neglect. It was because it forced itself so strongly upon us that we secured such an abundant supply of the best ore obtainable. For sixty years, I think, the United States Steel Corporation is supplied at its present rate of consumption, but sixty years is as nothing compared to the life of a nation. It is upon future discoveries of iron ore that the future of cheap steel manufacturing, even in America, depends.

"There are immense deposits in new inaccessible parts. In Utah, for instance, and in Southern California, large deposits have been found, so that steel will continue to be manufactured, but it would not surprise me if its cost was very greatly advanced in the future. It seems almost miraculous that such an article as steel could be produced and sold without loss at three pounds for a penny. I am convinced that this is a big thing of the past. It will be a question of increased cost, and therefore of increased price, so that neither Britain nor America need fear that steel manufacture will be wholly lost; the world gladly will pay the increased price necessary to obtain it. During the next half century, it seems that America is to increase her output at a tremendous pace. The output of Britain will, perhaps, remain stationary, or even increase somewhat, if developments in Norway and Sweden prove satisfactory."

The directors of Palmer's Ship Building & Iron Co., Ltd., Jarrow, have issued a notice offering to allow their employees to become shareholders in the company under a scheme set forth. Deposits will be received from persons employed by the company of not less than 1s., and not more than £1 of the depositor's weekly wages, the amount to be deducted through the wages sheet; but, if desired, no reduction will be made from short pays following holidays. Officials may deposit up to £2 weekly, and weekly paid employes may invest up to £200, while those paid quarterly may deposit up to £400. Interest at the rate of 4 per cent. per annum will be allowed.

IRON ORE PRODUCING AREA OF UNITED STATES.

The United States geological survey estimates the total iron ore area of the United States at 18,000 square miles. Of the aggregate it is estimated that the Lake Superior area, comprising at least 95 per cent. of the Bessemer iron ore supply, includes not less than 9,000 square miles, and the total may be a little more. The total shipment of Lake Superior ores in 1902 was 27,571,121 tons, of which the United States Steel Corporation produced 16,174,473 tons, or 58.6 per cent. of the whole.

The production of iron ore in 1901 divided into hard and soft ores by experts of the geological survey was:

States.	Long tons hard ore.	Long tons soft ore.
Minnesota	11,109,537	.....
Michigan	9,620,697	33,370
Alabama	.....	2,801,732
Pennsylvania	771,351	269,322
Virginia and West Virginia	2,024	922,370
Tennessee	.....	789,494
Wisconsin	725,496	13,372
New York	329,467	13,372
Colorado	6,978	397,059
New Jersey	401,989	.....
Montana, Nevada, New Mexico, Texas and Wyoming	229,294	5,220
Georgia, N. Carolina and S. Carolina	2,020	212,579
Kentucky and Iowa	.....	46,499
Ohio	.....	44,185
Connecticut and Massachusetts	.....	25,214
Maryland	.....	21,218
Missouri	11,226	3,004

This shows hard ores mined in seventeen states and territories in that year, while soft ores were produced in twenty-two states and territories.

The United States is now producing over 33 per cent. of the total iron ore output of the world. Of this total the United States Steel Corporation, counting the Bessemer ore production, is producing nearly 70 per cent.

The following table gives comparisons of the production of the principal countries and their percentage of the combined world output for 1901, the latest date available for comparison:

Countries.	Year.	Production.	Per-centage.
United States	1901	28,887,479	33.25
Great Britain	1901	12,275,198	14.13
Germany and Luxembourg	1901	16,570,258	19.08
France	1901	4,790,732	5.51
Spain	1901	7,906,517	9.10
Sweden	1901	2,795,160	3.22

In the hard ore districts of the Lake Superior region there were 123 active mines shipping ores in 1902 as compared with 104 mines in 1901, and 133 mines this year.

The active mines are divided among the five Lake Superior ranges thus: Marquette, 19; Menominee, 34; Gogebic, 27; Vermillion, 5; Mesaba, 48; total, 133.

CANADIAN SHIPPING NOTES.

Ottawa, Sept. 2.—The New Mount, intended for service on the great lakes, has arrived at Montreal from Hamburg. She is 248 ft. long, 42 ft. beam and 23 ft. deep. Her deadweight capacity is 3,100 tons. She can carry 2,000 tons on 14 ft. draught. She is equipped with six hatches.

The steamer Carolinea is still held fast on the rocks of Passe a Pierre near the mouth of the Saguaney river. The tug Lord Strathcona had to return to Quebec, not being able to release her. Her bow is high in the air and one can easily walk underneath it, but the stern is submerged and the lower deck flooded.

The Dominion government has signed a contract with Messrs. Colombier Bros., Bordeaux, France, to establish a steamship service between Bordeaux and Canada. The consideration is $100,000 for eighteen trips and $133,000 for twenty-four trips, if made during the season. In summer the line will run to Quebec and in winter to St. John and Halifax.

ITEMS OF GENERAL INTEREST.

While it is not definitely settled it is generally expected that Swan & Hunter, Wallsend, will build one of the Cunard flyers and that John Brown & Co., Clydebank will build the other.

The armored cruiser Maryland will be launched at the yard of the Newport News Ship Building & Dry Dock Co., Newport News, Va., on Sept. 12. Miss Jennie Scott Waters of Baltimore will christen her.

The cross-channel turbine steamer Queen is said to have behaved splendidly during recent southwesterly gales. In a gale of wind she crossed from Dover to Calais in fifty-nine minutes and arrived with a dry upper deck. The return passage was made, after taking in more water ballast, in sixty-nine minutes.

Rear Admiral Melville, retired, has completed arrangements whereby he starts for Mexico Sept. 9 on a two months' engineering expedition. He goes as a representative of the United Mining & Improvement Co. of New York to look into water power and electric plant plans connected with gold and silver mining.

English ship builders in July launched twenty-six vessels, of about 49,132 tons gross, against twenty-six vessels, of 52,208 tons gross, in June, and thirty-five vessels, of 78,617 tons gross, in July last year. For the seven months English builders have launched 170 vessels, of 354,714 tons gross, as compared with 160 vessels, of 432,646 tons gross, in the corresponding period of last year. There have been launched in the United Kingdom during the past seven months 334 vessels, totalling about 642,790 tons gross, as compared wth 345 vessels, of 791,792 tons gross, in the first seven months of last year.

On her official four-hour trial held this week the cruiser Cleveland made a speed of 16.5 knots, but owing to two delays for which she was not responsible (one a schooner crossing her bows) her corrected average will be 16.42 knots. The trial was over the Cape Ann course and was held under the auspices of a naval board consisting of Capt. Charles T. Train, Capt. L. C. Logan, Naval Constructor J. J. Woodward, Com'dr W. C. Cowles and Lieut. Com'dr J. R. Edwards. The Cleveland is 297 ft. long, 44 ft. beam and 15¾ ft. draught. Her displacement is 3,200 tons and her horse power is 4,200.

The manufacturers of the United States imported nearly $500,000,000 worth of materials for use in manufacturing, in the fiscal year just ended. Materials for use in manufacturing thus formed nearly one-half of the total imports of the United States last year. The department of commerce and labor through its bureau of statistics, in a table just completed, shows that the total value of manufacturers' materials imported in the fiscal year 1903 was $489,471,667, and that this formed 47.73 per cent. of the total imports. In the preceding year the total value of the manufacturers' materials imported was $415,000,000, and formed 46.14 per cent. of the total. In 1898 the total importation of manufacturers' materials was $247,000,000, and formed 42.07 per cent. of the total.

There has been of late a growing desire on the part of the imperial authorities both to develop Russian ship building at home and also to provide a supply of officers and men for the merchant service. The Bourse Gazette announces that to these ends the board of merchant shipping and harbors intends to establish a large model ship building yard. The projected yard will accept only private orders to build ships; in this respect it will differ from the existing yards, as the latter seek to secure orders only from the state. In the model ship building yard such students as attend the polytechnic schools for the purpose of studying ship building will be afforded actual practice in ship construction. Moreover, the board referred to will order shortly a new training ship, which will be fitted out to accommodate 100 students of navigation.

The battleship Dominion has just been launched at Barrow. The Dominion is the last of the three ships known as the King Edward VII. class. When completed the vessel will have cost $6,500,000. The next battleship to be laid down will be of 18,000 tons displacement, or 1,650 tons heavier than the Dominion. The Dominion is a first-class battleship of 16,350 tons displacement. She is 425 ft. long, 78 ft. beam, draws 26¼ ft. of water, has 18,000 I. H. P. and will have an estimated speed of over 18 knots. The warship will carry 950 tons of coal, will have a complement of 800 men, and her armament will consist of four 12-in. guns, four 9.2-in. guns, ten 6-in. guns, twenty-four small rapid-fire guns, and two torpedo tubes. Her armor belt is of Krupp steel 9 in. thick; she has 8 in. of Krupp steel on her sides above the belt, her bulkheads are of Krupp steel 12 in. thick, her heavy guns are protected by from 6 to 12 in. of Krupp steel, and her steel deck is from 1 to 2 in. thick.

The French navy have been carrying out some daring gunnery experiments at Brest with the turret of the Suffren to ascertain the effect which would be produced by a heavy shot striking it. The turret shelters two guns of 305 mm. bore, and the steel armor plating is 26 cm. thick. To prevent it being injured the turret was coated with additional armor plating. The whole of the crew of the Suffren remained on board while the shots were fired from the Massena with one of her heaviest guns of 305 mm. bore. The charge of powder was reduced so as to make the shock equal to that which would be produced with a normal charge from a distance of about 1,500 m. According to the Paris correspondent of the Standard, the turret was struck full by the first shot, and after the effects had been carefully examined, a second shot was fired. The shell was shattered against the armor plating, and a portion of it, weighing several kilogrammes, bounded back to the deck of the Massena, where it did some damage, without, however, injuring anyone on board.

The first of a series of special service inspection steamers for the use of the Egyptian government on the Nile has recently been built by the Thames Valley Launch Co., Ltd. There will be altogether ten or twelve of these small screw steamers, and each will be in charge of an inspecting officer, for whom every comfort is provided on board in the way of sleeping and living accommodation. There is a comfortable cook's galley aft, with engineer's bunk and store-room abaft this. In the saloon there are two comfortable berths fitted with mosquito curtains, and there are copper gauze sliding frames to each window, as well as a glass pull-up sash and sliding jalousies outside. The saloon top forms a promenade deck with awning, and a companion ladder is fixed at either end. The steering is at the after end of this deck. The whole of the upper works, saloon, etc., are made to take down and pack inside the hull for shipment. The hull is built of steel, and the machinery is of the compound surface-condensing type, developing a speed of 8 to 9 miles per hour.

SHIP BUILDING IN SCOTLAND.

Glasgow, Aug. 20.—The only new feature in our ship building industry is the renewal of the wages dispute. Meetings have been held between the local members of the Employers' Federation and the officials of the Amalgamated Society of Engineers, with regard to the wages of machinists, but no result was arrived at and the constituents on both sides are being consulted. There will be further meetings shortly and the ship yard workers also have to be dealt with. Meanwhile at Belfast a reduction of 5 per cent. is being made in the wages of all hands, but then the chief Belfast employers are not in the Employers' Federation. Both on the Clyde and in the north of England signs of revolt are appearing and the outlook is serious.

Commenting on the depression in ship building, Mr. Wilkie, the general secretary of the Associated Shipwrights, however, says in his monthly report: "At the recent meetings of the several branch representatives on the wages question, more especially in regard to those of the Clyde district, those who were present will remember the glowing statements as to the work on hand that were given by some representatives, and when we ventured mildly to question the accuracy of these statements, we were roundly abused because we dared to doubt. We pointed out that a few months would prove the correctness or incorrectness of the assertions made. Now we not only have the proof from the ship building statistics, published in the press, but we have it also confirmed by our own returns and those very branches now report trade 'bad' and 'very bad.' We merely mention these facts to show members the danger of accepting mere impressions for facts and the necessity in all such cases of careful inquiry and accurate information, and a little less apparent animus against the general officers in their best, if humble, efforts in behalf of their trade and their fellow-members as a whole."

GREAT VESSEL FOR SOUTH AFRICAN TRADE.

Trade between Great Britain and South Africa has so developed that in less than a quarter of a century the size of the steamers engaged in the traffic has been quadrupled. The fleet of vessels employed in this trade, in which America is now competing, is receiving constant additions, and the twin-screw steamer Armadale Castle, just launched, is one of the largest ships ever constructed for the service. The new steamer is a magnificent vessel, with a gross tonnage of 12,800 tons and engines of 12,500 I. H. P., built by the Fairfield Ship Building & Engineering Co., Ltd., for the South African royal mail service of the Union-Castle Mail Steamship Co., Ltd., London. The Armadale Castle is built with a straight stem and elliptical stern, a very long forecastle, and a promenade deck and poop extending about four-fifths of the length of the vessel. She is constructed of steel throughout to the requirements of the Board of Trade, for a foreign-going steamer, and with scantlings as required by Lloyd's latest rules for the 100 A1 class. A cellular double bottom is fitted the full length of the ship, and the holds are subdivided into separate compartments by watertight bulkheads, which are arranged and constructed so as to obtain every security, a double collision bulkhead being fitted forward. All the decks are plated, and sheathed with teak where exposed and with yellow pine where under cover. The new steamer has two large elliptical funnels, each 120 ft. long, and 14 ft. 4 in. by 11 ft. 2 in. diameter, and two raking pole masts, fore and aft schooner-rigged. Her dimensions are as follows: Length over all, 590 ft. 6 in.; length on water line, 568 ft. 8½ in.; breadth extreme, 64 ft. 6½ in.; depth molded, 42 ft. 3 in. Accommodation is provided for over 350 first-class passengers berthed amidships, about 200 second-class also amidships, and about 270 third-class berthed aft, all being quartered in state rooms. The state room accommodation is arranged on the main, upper, and promenade decks.

The propelling machinery consists of two sets of quadruple-expansion balanced engines, each set having four cylinders working on four cranks. The high pressure and first intermediate pressure cylinders are each fitted with a piston valve; the second intermediate and low pressure cylinders having ordinary flat slide valves, all worked by the ordinary double eccentric and link motion valve gear. Each reversing gear is controlled by a double cylinder steam reversing engine. The crank shafts are in four sections, each section being built, and together with the thrust, tunnel, and propeller shafts, are of forged mild steel. The propellers have each three blades of manganese bronze, the boss being of cast steel. The condensing water is circulated through the condensers by two large centrifugal pumps, one for each condenser, and each worked by an independent engine. Both circulating pumps are connected to large valves leading to the bilges, so that in the event of a serious leak in the ship, these pumps could be utilized for pumping out the engine-room. The engine-room is fitted with all modern appliances, and includes two evaporators, working in combination with two distillers, for supplying fresh water to the ship and to the boilers, and large feed filters and a suitable heater. A complete installation of donkey pumps are fitted suitable for the special nature of the service to the Cape. The boilers for generating the steam for the engines are ten in number, namely, six double-ended and four single-ended of the ordinary multitubular marine type. They are constructed entirely of steel, and are adapted for a working pressure of 220 lbs. per square inch. Each of the double-ended boilers has six furnaces, and each of the single-ended four furnaces, making a total of fifty-two furnaces. A walk half a dozen times round the promenade deck means about a mile.

Returns have been issued of British ships sold to foreigners, in each year from 1875 to 1902. The high-water mark was touched in 1898, when 149,071 tons were transferred. In no other year has 100,000 tons been reached, and in 1902, despite fears about American combines, the total was 38,323 tons— a quantity lower than in any of the years, with the exception of 1876, 1886 and 1891.

NEW TORPEDO BOATS GIVING SATISFACTION.

The new type of torpedo boat recently added to the navy is said to be giving general satisfaction and proving more reliable at sea. These boats are 166 ft. long and have engines of 2,900 I. H. P. to give a maximum sea speed of 25 knots. Tests made with some of the boats show that a speed of 12 knots can be maintained for 2,200 sea miles, a ton of coal being sufficient to drive the ship for 52.36 miles, but when the speed is increased to 15 knots, the same coal only suffices for 30.64 knots; and at full speed the ton of coal will only serve for about 9 knots. Instead of going 2,200 miles at 12 knots with her normal fuel supply the same quantity of coal would only allow the vessel to steam 300 miles at her full speed. These vessels are the first to undergo trials according to the new conditions for torpedo craft. These contract requirements call for three trials—a preliminary one of two hours, a coal consumption test, and a subsequent speed test, each of four hours' duration. There is a quarter-knot margin allowed on the consumption four hours' trial, but only one of the five new boats just completed by Thornycroft fell short on any trial, and that was due to an oil pipe going wrong on a gas engine. The speeds ranged from 25.122 to 25.436 knots.

A pretty three-masted schooner, with lines like a yacht, has been launched from the Greenock yard of the Grangemouth & Greenock Dockyard Co. for German owners. She has a dead-weight carrying capacity of 500 tons, and her dimensions are—length, 130 ft.; breadth 27½ ft.; and depth 12 ft. She has been specially designed with a view to fast sailing. She will trade between Laguna and West Indian ports. The vessel is the first of a fleet to be built, which will be named after musicians, the first being named Flotow.

It is stated that only one Japanese battleship will be ordered this year; but there is a chance that two may be given out to British firms if prices are sufficiently tempting. The Japan naval constructor for Europe is receiving tenders from a few firms on the specifications forwarded from Japan. These vessels will only be excelled by the very largest of British ships. As to the cruisers, the Japanese government entertain the hope that they will be able to complete them at home. They consider that the new steel works at Kure will be able to manufacture the armor needed for the cruisers; but this is probably too sanguine an expectation. The great bulk of the armor for the cruisers will doubtless be placed with Sheffield firms, even should the vessels themselves be built in Japan.

PROPER BALLASTING OF SHIPS.

The Board of Trade in a letter addressed to associations of ship owners, ship builders, underwriters, ship masters, and also to registry societies and local marine boards, enclosing a copy of the report from the select committee of the house of lords on light load line, have pointed out that, although the select committee did not recommend the adoption of a light load line, yet they clearly indicate that the question of the proper ballasting of ships demands the serious attention of all concerned in building, equipping and navigating merchant vessels; and they recommend that regulations as to securing loose ballast should be drawn up and enforced by the department, and that a warning should be issued against the practice of throwing ballast overboard before a vessel arrives at her destination. The board have accordingly prepared instructions to their principal and detaining officers and surveyors, and have also issued a warning to ship owners and masters on this subject, and urge the importance of careful attention being given to the question of ballasting in all its bearings. The board have no statutory authority to make more specific regulations regarding the ballasting of ships; but, while cordially recognizing the consistent efforts that have been made by owners and builders, as well as by the registry societies, to solve a problem which is necessarily one of considerable difficulty and complexity, they rely on the assistance and co-operation of all concerned in order that this question may continue to receive the careful attention which, in the interests of safety of life and property at sea, its importance demands.

The Austro-Americana Societa di Navigazcone of Trieste, under the auspices of Funch, Eyde & Co., acting in conjunction with the Louisville & Nashville railway, is about to inaugurate a new steamship line to operate between Pensacola and various Mediterranean ports. A fortnightly service will be given. The European ports of call will be Valencia, Marseilles, Genoa, Spezia, Leghorn, Cevita Vecchia, Naples, Venice, Fiume and Trieste. The vessels will also call at other Spanish ports as occasion requires. The new service is to be performed by a number of the large and modernly constructed Austro-Americana steamers. Cargo will only be carried. Phosphate lumber, naval stores and cotton will be the chief items of freight. The Gulf Transit Co. of Pensacola will represent the new line at that Florida port. Funch, Edye & Co. for the last eight years have been dispatching about eighteen chartered boats per annum from Pensacola to Genoa and Venice chiefly. The new regularly fortnightly service will commence early in October.

SCOUT SHIP WITH TURBINE ENGINES.

The naval board of construction has approved the recommendation recently made by Rear Admiral Melville, lately retired, that a trial be made of the new turbine engines by placing them in a scout ship, to be used for experimental purposes by the bureau of steam engineering. If the suggestion meets with the favor of Secretary Moody, congress will probably be asked for an appropriation of $300,000 for the construction of a ship of about 5,000 tons, to be equipped with turbine engines of the approved pattern. Real Admiral Melville, while not committed to the new type of engine, believes it should have a thorough trial, in view of the promising character of experiments on commercial vessels. Attention is called by Rear Admiral Melville to the ability to rapidly utilize superheated steam and to the increased speed attainable by the use of turbine engines. Plans for a scout ship of the required size have been drawn, and have received the approval of the board on construction.

Rear Admiral Melville's letter to the secretary of the navy upon the subject was as follows:

"Sir:—1. I respectfully recommend that one of the new vessels of the navy, of not over 5,000 tons displacement, and, preferably, of the scout or very fast cruiser class, be fitted with steam turbines instead of reciprocating engines.

"2. My reasons for this recommendation are that the steam turbine has now passed beyond the experimental stage and various vessels in which it has been fitted particularly fast passenger steamers, have proved eminently successful.

"3. The first advantage claimed for the turbine, by its builders, is that the engine room weights will be very materially cut down. Now, though this is true, it is so to a less extent than often supposed since the same boilers, condensers, pumps and other auxiliaries have to be used in either case and the saving is only in the weights of the motor or engine itself and the shafting and propellers; still this saving will be, in the case of a high powered vessel, a matter for serious consideration when choice of machinery is made. In my opinion, however, there are other advantages in the use of the turbine even more important than the saving of weight, and some of these are as follows:

"4. A steam turbine is, as is well known, both in theory and design, the simplest of all motors, consisting only of a revolving shaft, on which is keyed a drum carrying the moving arms or vanes, inclosed in a cylinder containing the stationary arms and having at each end a bearing in which the shaft and drum revolve. Steam enters at one end of the cylinder, blows through the vanes or arms, and then emerges at the other end and is conveyed to the condenser by the exhaust pipe. The two bearings at the ends of the cylinder for the shaft are the only bearings or rubbing parts in the motor, and as there are no valves, valve gear nor reciprocating parts to wear loose, get adrift or require attention and lubrication, but little care is required after the turbine is started, there will be no steam leakage caused by packing rings breaking or wearing loose with consequent increase of coal consumption; if the boilers prime, one of the most frequent causes of breakdowns in a reciprocating engine, no damage will be done since the wet steam, or water, or spray will simply blow through.

"5. The principal objection heretofore raised against the use of the turbine has been that it is very wasteful of steam and must be run at an excessively high speed of revolution. Now, though this may have been true formerly, it is not so at present, since carefully conducted experiments have shown that the improved turbine of today will develop its power on as low a consumption of steam as the best reciprocating engine when both are running at their designed power; when both are running at reduced power the steam consumption per horse power increases very rapidly but no more rapidly with the turbine than with the engine. Turbines, too, as at present designed, can be run at their highest economy at very reasonable speeds of revolution.

"6. It should also be particularly emphasized that whatever may be the economy of a turbine when first installed, the turbine will continue to work with the same economy almost indefinitely, since there are no interior parts to wear loose and allow steam to blow through to the condenser without performing its share of work.

"7. Another point, that appeals very strongly to the engineer and may affect the efficiency of the ship at a critical time, is that as there are no internal rubbing parts no internal lubrication will be required; this means that there will be no cylinder oil to work into the condenser and coat the boiler tubes, with consequent pitting and overheating of fire surfaces.

"8. With a turbine little or no care or precaution is required in starting or reversing, and these operations can be performed as rapidly as the necessary valves can be manipulated.

"9. Turbines are now reversed by means of a supplemental set of reversing blades and nozzles to which steam is admitted when desired.

"10. As the propellers used with turbines are smaller than those with reciprocating engines the tips of the upper blades will be more deeply immersed and less likely to be uncovered by the pitching of the vessel so there will be less possibility of racing. But even if racing does occur, there will be no risk of serious injury or breakdown as with a reciprocating engine.

"11. There will be little or no vibration caused by the turbine and the vibration from the propellers will be greatly decreased by reason of their smaller size. This absence of vibration and perfect balance of the parts will allow much lighter engine platforms to be used.

"12. The absence of all interior rubbing parts will allow highly superheated steam to be used, which cannot be done satisfactorily with the reciprocating engine; this in turn will add greatly to the economy of the turbine. As most water tube boilers are well adapted to the use of superheaters it is very probable that the introduction of turbines will quickly be followed by the use of superheaters for marine work.

"13. As each turbine has but two bearings there is nothing to get out of line in the turbine itself; in the case of a reciprocating engine there are generally four main bearings that must be kept in perfect alignment and reciprocating parts that must be kept in right angled alignment with the main bearings. As the turbine would have but two bearings, any working of the vessel would not disturb it and could only tend to throw it out of adjustment with the line shaft; this tendency, however, would be no greater than is now the case with the engine.

"14. The absence of all working parts except a few of the very simplest description, and especially the absence of linkages and interior rubbing parts in the steam spaces, reduces the cost and labor of upkeep to the minimum; this, though important, is not so important in the case of a naval vessel as is the liability to keep the sea almost indefinitely without laying off the engine for repair.

"15. The lubrication of a turbine is almost ideal since the absence of adjustable bearings permits forced lubrication without appreciable loss of oil or any of it being carried into the condenser by the exhaust. The same oil can be pumped through the bearings over and over again, being cooled in passage by a water coil.

"16. Many additional reasons for the use of the steam turbine might be given, but my desire has been to make this letter as short and concise as possible; I believe, however, that the preceding will be more than sufficient to justify my recommendation. The ability to use highly superheated steam, the few moving parts and the ease of manipulation are alone sufficient to warrant its use.

"17. It will also be noted that I have only recommended the use of a turbine in a vessel of moderate size. This is not because I have not faith in it but because I do not consider it good policy to change the type of motive machinery of battleships and large cruisers till after long and exhaustive trials and experience with the new motor in vessels of smaller size and less importance.

"18. As this is a matter of great importance, I respectfully request that it be referred to the board on construction for consideration."

PACIFIC COAST LUMBER TRADE.

Editor Marine Review: Our lumber interests on the Pacific coast are of a magnitude not generally realized. The mechanical equipment is unequalled by that of any other lumber field in the world. We are informed by the department of commerce and labor, through its bureau of statistics, that the Pacific lumbermen have been rapidly enlarging their area and volume of commercial distribution, both in the foreign and domestic markets. According to figures gathered by the bureau of statistics, the redwood shipments in 1902 from upper California, mostly to San Francisco and the southern coast, amounted (using round numbers for the purpose of this article) to 260,000,000 ft. In addition, the California coast alone received, in the past three fiscal years, pine and fir to the extent of: 1900, 370,000,000 ft.; 1901, 408,600,000 ft.; 1902, 606,000,000 ft. These figures show an enormous increase, particularly in 1902, over 1900.

The trade on the north Pacific coast has expanded in equal volume. Shipments, by water alone, from Seattle, show: 1901, 506,000,000 ft.; 1902, 564,000,000 ft.

A movement of almost equal proportions is taking place to points in the interior of the United States by rail. These figures show: 1901, 364,000,000 ft.; 1902, 562,000,000 ft.

In shingles sent east of the Cascade mountains, extending into the territory east of the Missouri river, and in many cases as far as the lakes, the records tell us: 1901, 4,485,000,000 ft.; 1902, 5,080,000,000 ft.

The railroads are benefiting largely by these enormous shipments of lumber and shingles. From Seattle alone were sent: 1900, 3,141 carloads; 1901, 4,520 carloads; 1902, 6,026 carloads.

Portland, Ore., ranks next to Seattle in rail lumber shipments. The record is: 1900, 11,986 carloads; 1901, 13,517 carloads; 1902, 15,876 carloads.

The heavy increase hereby shown in rail shipments of lumber from the Pacific coast to points east is a noteworthy contribution to transcontinental tonnage, insuring, as it does, return freights for the freight trains sent to the Pacific. This is as necessary as return cargoes for ships. The opening of the Mississippi valley to the Pacific coast lumbermen brings the export trade from the coast into closer relations with the demands of the domestic consumer. He thus becomes directly interested in the progress of lumbering, both in the northwestern states and the southern states, as main sources of supply. The entire east is chiefly dependent for its immense consumption of lumber on these two sources.

The principal mills of the state of Washington reported for 1902 that 380,000,000 ft. were sent to the coastwise destinations and 153,000,000 ft. to foreign destinations. If this ratio holds good for the Pacific coast as a whole, it means that as much as 70 per cent. of our Pacific coast lumber cut is put to domestic uses.

WALTER J. BALLARD.

Schenectady, N. Y., Aug. 28.

NEWS OF THE GREAT LAKES

CHICAGO GRAIN SITUATION.

Chicago, Sept. 2.—The rate situation is practically unchanged from previous report with the shipping inquiry and vessel supply about at even lines, 1⅛ cent wheat, 1 cent corn and ⅞ to 1 cent oats for Buffalo, Port Huron and Georgian bay. There is very little doing in wild chartering to Lake Ontario, the trade being confined to the routes with through connections to Quebec and Montreal on the basis of about 3¾ cents per bushel on corn.

Of the shipments for the week just closed as noted below the rail lines took 50,000 bu. of wheat, 135,000 bu. corn and 560,000 bu. oats; via lake to Buffalo about 160,000 bu. wheat, 125,000 bu. corn and 265,000 bu. oats; and to Canadian points 75,000 bu. corn and 460,000 oats. The shipments, lake and rail, together with stocks of grain follow:

	Week just closed.	Last week.	Same week last year.
Wheat	232,645	417,420	1,743,145
Corn	2,125,926	1,907,797	991,303
Oats	1,278,215	1,939,188	1,478,329
Total	3,636,786	4,264,405	4,212,777

	Shipments since Jan. 1, 1903.	Same time last year.
Wheat	13,146,252	21,537,113
Corn	54,134,312	27,638,154
Oats	43,836,305	37,005,103
Rye	323,623	1,679,499
Total	111,440,492	87,859,869

Stocks of grain are slightly in excess of those of the week previous and vastly in excess of those of the corresponding week for the preceding year.

	Week just closed.	Last week.	Same week last year.
Wheat	6,138,000	5,328,000	5,806,000
Corn	4,170,000	4,713,000	1,964,000
Oats	5,020,000	4,817,000	1,702,000
Rye	388,000	462,000	87,000
Total	15,716,000	15,320,000	9,559,000

LAKE FREIGHT SITUATION.

The hope of the vessel owner is the grain trade, which up to now has been more promise than performance. They are hopeful, however, that it will improve and put the market in better shape than it has been. Grain was a continuous disappointment during August and at times there was not sufficient of the commodity to even supply the line boats. Consequently vessels sought the ore trade with the result that there are more vessels than cargoes, especially at Escanaba. Meanwhile the United States Steel Corporation has been practically out of the market for wild tonnage. For a few days the Steel Corporation even threw its smaller craft into the coal trade. Coal shipments are falling off and the outlook for vessels that are depending entirely upon wild cargoes does not appear bright. Added to this is the knowledge that furnaces and docks are well stocked with ore, with the consequent uncertainty of the continuance of its sustained movement. Ore shipments for August have not yet been compiled. Rates are holding steady and there is no talk of lower carrying charges.

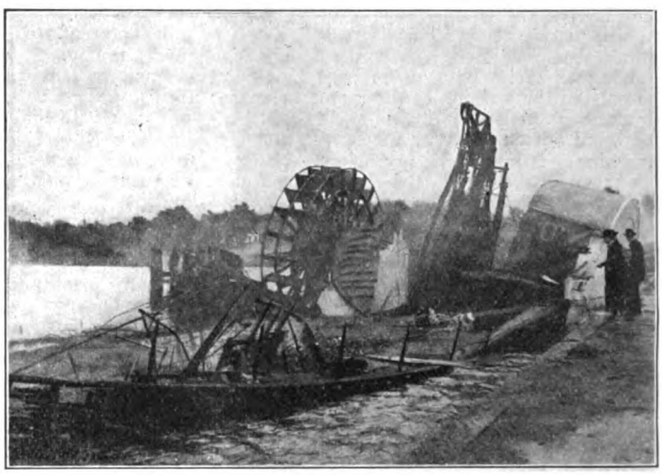
COLUMBIA IRON WORKS AFFAIRS.

At the meeting of the creditors of the Columbia Iron Works at the Oakland hotel, St. Clair, Mich., last Thursday no progress whatever was made toward reorganization or settlement. The committee was continued and the Hon. Franklin Moore of St. Clair was added to it. As soon as the committee formulates a plan it will call a meeting of the creditors, probably at Cleveland. The committee made a thorough examination of the books of the concern and found them to be in very bad shape. It was impossible to determine from the system of bookkeeping precisely what the condition of affairs was. It could not be determined from the books whether a profit had been made on the steamers already completed or not. It was decided to have the committee appear before the circuit court when the case is called, procure an adjournment, if possible, and then to formulate a plan of reorganization to be presented to the creditors. The plan to have the creditors take stock to satisfy their claims was not looked upon with favor owing to the unsatisfactory showing.

The Edward Hines Lumber Co. has purchased the schooner Helvetia from Henry Johnson of Cleveland.

SIDE-WHEEL STEAMER PITTSBURG BURNED.

The side-wheel passenger steamer Pittsburg which has been running between Cleveland, Windsor, Sarnia and Georgian bay ports in the summer tourist trade, was burned to the water's edge while lying at King's dock, Sandwich, last Sunday morning. The origin of the fire is unknown. The photograph accompanying this article shows the present state of the steamer. At the time of the fire she was being laid up for the winter, only the engineer's crew being aboard of her. The crew maintain that there was no fire whatever aboard the steamer when they turned in at the usual hour on Saturday night. Noises were heard during the night as of some one walking about and a member of the crew got up to search. No one was seen, but a little later smoke poured into the quarters of the crew. The members of the crew



Steamer Pittsburg after the Fire.

had scarcely time to collect their belongings before the whole vessel was in flames. The Sandwich fire department fought loyally but was unable to save the steamer, which finally settled to the bottom. The Pittsburg was formerly the old steamer Carmona. She was 221 ft. long, 28 ft. beam and 12 ft. deep and was built at Port Robinson, Ont., in 1871. She was rebuilt at Collingwood, Ont., in 1900. Her career has been a checkered one. Last spring she was sold at marshal's sale and bid in by the Detroit Savings Bank and turned over to the Georgian Bay Navigation Co. for operation. She was valued at $60,000, though only insured for $27,000.

LAKE SUPERIOR BOND PLAN FAILS.

As the subscriptions by stockholders to the proposed bond issue of $12,500,000 of the Consolidated Lake Superior Co. amounted to only between $3,000,000 and $4,000,000 it has been decided to abandon the plan and it is reported that a complete plan of reorganization is being considered. A director of the company made this statement:

"A syndicate is now being formed to advance $8,000,000, needed by the company to pay off current loans, and to provide additional working capital. The company will not be placed in the hands of a receiver. Interest on the Speyer loan has been paid regularly, and unless there is a default of interest, payment of this loan will not be forced. In May the company earned $140,000, in June $160,000, and the earnings were still larger in July. The capitalization of the company is to be reduced, but further than that I can say nothing regarding the proposed plan."

Advices from Philadelphia say that the plan calls for the formation of a new corporation, with the exchange of old stock for new, on payment of assessments by stockholders.

NO SEVEN-MASTER ON THE LAKES

Editor Marine Review: Will you kindly state whether any seven or eight-masted schooner has ever sailed on the great lakes, and if so, when? J. W. C.

No seven or eight-masted schooner has ever sailed on the great lakes. The David Dows, a five-master, was the largest.

Capt. Henry Berlin, formerly of the steamer Tokio, died at an hospital in Escanaba last week of pneumonia. He was a resident of Detroit.

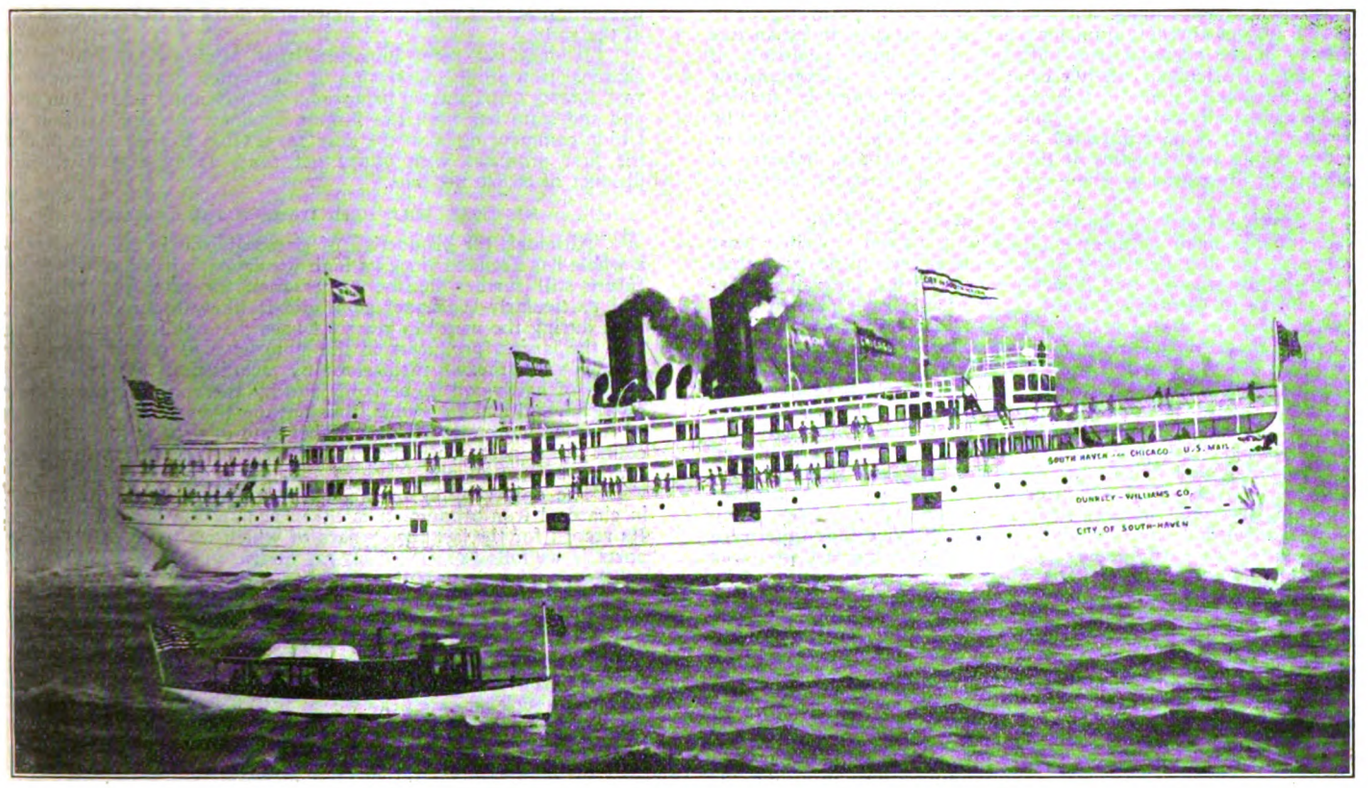
COST AND BENEFIT TO FARMERS.

Mr. John J. D. Trenor, chairman of the committee on contribution of the Canal Association of Greater New York, has prepared an address to farmers on the advantages of the barge canal for New York state which is exceedingly interesting reading. The great card of the opposition is to endeavor to impress the farmers with the excessive burden of taxation which they will have to bear. Mr. Trenor shows that for every $1,000 of valuation the farmer will be assessed 12 cents, or the summer price of a dozen eggs. He said:

"The one great stimulus to commerce generally is the ability of the producer to supply the wants of the consumer at a minimum of cost. That which tends to make this possible is the acme of business enterprise. Facility and cheapness of transportation are the keynotes of the situation. Of all known methods of shipment, water transportation is conceded to be the cheapest. When the foresight of the immortal Washington disclosed the possibilities of water highways through this state and later, when the first communication by canal was established through the indomitable energy of DeWitt Clinton, the signal was given for new life and commercial development in the state of New York. Towns sprang up like magic alongside its waterways, bustle and activity were on every hand and within a few years the population of the state had increased to a remarkable extent. New York ranked supreme. So great indeed was this impelling force that railroads were speedily called into existence to handle the ever increasing quantities of products requiring transportation. You all know the story, probably better than I do; competition begot improvements, until today we stand, in mute astonishment and admiration, at the marvels of railroad transportation. Forty years ago, an engine capable of drawing a train of twenty loaded cars of 10 tons each was considered little short of wonderful. Today, we see the monarchs of the road, in all their majesty, hauling trains of eighty loaded cars, averaging 30 tons each at a speed that would in olden times have been deemed remarkable for even a passenger train.

"But have our canals received the benefits of the same care, study and determination to bring them up-to-date? Alas, no. There is to be seen today the same slow, patient and non-progressive mule of our forefathers, the same restricted canals and a sad falling off in the population instead of increased numbers, enlarged waterways, thoroughly modernized and equipped with methods of propulsion, enabling the canals of the state to carry a vastly increased tonnage at a greater speed and of a more diversified character than at any previous time.

"It has been calculated that the total cost of enlarging and improving the Erie, Oswego and Champlain canals so as to accommodate barges of 1,000 tons capacity will be $101,000,000. It must be borne in mind that this figure is arrived at by adding 25 per cent. to the estimate of the engineers and others appointed to make the necessary surveys, and than whom this state never had the advantage of a more able set of men. The cost seems staggering, but if we compare it to the amount expended on the original Erie canal, and then compare the aggregate wealth of the state at that period with its present colossal proportions, you will find the proposed expenditure to be relatively small. Again, if you are told that the difference, in a single year, between rates charged by canal and those the railroad would collect, were the canals not in existence, would amount to nearly $25,000,000, the expenditure named hardly seems excessive, even if the saving extended over a period of only ten years. But it embraces all time. Do you suppose for one moment that if the other canals of the state were permitted to go the way of the Chenango canal that the railroads would commemorate the event by a sweeping and permanent reduction of their rates? They might, but history records few acts of charity on their part. On the contrary, one has only to glance at Pennsylvania to find that when the canals of that state were left to the tender mercies of the railroads, that instant water development began to touch its lowest level and railroad rates their highest. There must be those amongst you tonight who well remember the change that came, and has ever since remained over the commerce of this most beautiful and productive county when the shortsightedness, or worse, of those who should have conserved its interests permitted the Chenango canal to fall into its present state of decay. It requires no stretch of the imagination to picture a like condition all over the state should a similar fate befall the other great waterways. But, assuming all these great benefits to be wanting, and we come back to the original question—who foots the bill?



Steamer City of South Haven owned by the Dunkley-Williams Co., South Haven, Mich

[*Built by the Craig Ship Building Co., Toledo, O.*

"The answer is simple. The notably large cities, such as Greater New York, Buffalo, Rochester, Syracuse, Troy, Albany, etc., contribute 85 per cent. of the total cost of the improvement. But what is it going to cost you? Well, under the present system of indirect taxation, and the proposed practical abolishment of direct taxation after three years, we find the result to be positively startling, in fact, a veritable hold-up. To state matters more clearly, it is simply this: On every $1,000 dollars of assessed valuation, the farmer will be asked to pay the exorbitant tax of 12 cents per annum for a period of three years when direct taxation will probably be a thing of the past; a total contribution represented by the giving away of a couple of pounds of butter or a couple of dozen of eggs, as each man's individual share of the total burden of this colossal undertaking. The amount is so infinitesimal as to be ridiculous, yet such is the fact, and I ask your careful investigation of this vital point in order to silence for all time the unfair opponents of the measure who have left no stone unturned to make the farming community believe that canal improvement means the mortgaging of their farms to pay the tax. A greater or more deliberate untruth was never circulated.

"Now, what benefits are you to derive from the expenditure named. Can you picture to yourself a vast army of laboring men over a great area of the state for a number of years, and the thousands of others that follow in their wake, demanding food supplies of every description in large quantities, and not see that to the farmer this means an increased demand for every product that his skill and energy can wrest from the land he tills? Does it not mean a more constant and heavier demand for his cheese, butter, milk, eggs, etc., and so enable him to reap a thousandfold the harvest of his contribution to canal enlargement?"

CHARCOAL IRON INDUSTRY.

Mr. W. G. Mather Traces Its Development in Michigan—Upper Peninsula Will Hold Its Own in Charcoal Iron Making for Ten Years at Least—Fine Collection of Old Photographs.

At the recent meeting of the Lake Superior Mining Institute at Ishpeming, Mr. W. G. Mather, president of the Cleveland-Cliffs Iron Co., read a most interesting paper upon the charcoal iron industry of Michigan. Especially valuable was it in its illustrative features. He had gathered together photographs of the early forges of the upper peninsula of Michigan, of the small furnaces which succeeded the forges, of the primitive docks and of the equally primitive vessels employed in the ore trade, of the outcroppings where ore was first discovered and of many photographic evidences of the initial development of this industry. He crowned his stereoscopic exhibition with a photograph of the Hon. Peter White, who has been identified with the development of the iron region since it has had a commercial existence. Mr. Mather will be obliged to anyone who can add either to his collection of early photographs or to his information concerning the charcoal iron industry—both of which he admits are lacking in completeness. Among other things, Mr. Mather said:

"I am not attempting in this brief paper to give an exhaustive history of the charcoal iron industry of the upper peninsula of the state of Michigan, neither have I had time to so examine the authorities, as to make in this sketch, a record which is intended to be historically correct. In other words, I preface my paper by saying that it is only intended to briefly set before the institute, a few points and statistics of the history of the iron industry of Michigan, illustrated by some pictures of the furnaces, both new and old.

"If we go back to the census of 1840, we will find that the state of Michigan is there credited with fifteen so-called blast furnaces, but doubtless most of these plants were little more than forges or bloomeries, and if we also pass by the Jackson Mining Co.'s forge at Carp river, commenced in the latter part of 1847, and finished in the early part of 1848, and the Marquette Iron Co.'s forge at Marquette, put in operation in 1850, and the Collins Iron Co.'s forge at Dead river, about 3 miles northwest of Marquette, finished in 1855, and one or two other small forges we are brought immediately to the first regular blast furnace built in Michigan, namely, that belonging to the Pioneer Iron Co. at the present site of the city of Negaunee. This was commenced in June, 1857, and finished in February, 1858, and another stack added in the same year. Pioneer furnace No. 1 was put in blast April 18, 1858, and Pioneer furnace, No. 2, May 20, 1859. They burned down and were rebuilt in 1877, and since that time were regularly active until June 1893, in which year the last iron was made in this old historic plant. The same company continued its operations in new furnaces, namely, the Pioneer furnace at Gladstone, put in operation April 16, 1896, and Pioneer furnace, No. 2, at Marquette, put into blast April 15, 1903 and is now also operating the Carp furnace at Marquette, which was built in 1873.

"The growth of the product of the whole state of Michigan in pig iron by decades is as follows in gross tons: 1858, 1,629 tons; 1860, 5,660 tons; 1870, 49,298 tons; 1880, 137,879 tons; 1890, 230,769 tons; 1900, 163,712 tons; 1902, 155,213 tons.

"The high water mark of the state was apparently reached in 1890, when the product was 230,769 gross tons, although it looks now as if in 1903, this would be slightly exceeded.

"Charcoal is not of course holding its own with coke iron. It cannot be produced as cheaply and the demand for its better quality at the necessarily higher price that must be asked for it, is limited. The following table illustrates this declining relative position of charcoal iron very clearly:

PERCENTAGE OF CHARCOAL IRON TO TOTAL PRODUCTION IN UNITED STATES.

Year.	Percentage.	Gross tons charcoal iron	Total gross tons all kinds pig iron.
1810	100.0	53,908	53,908
1830	100.	165,000	165,000
1840	91.	286,903	315,000
1850	59.	333,205	564,775
1860	30.3	278,331	919,770
1870	19.5	365,000	1,865,000
1880	12.5	537,558	4,295,414
1890	6.9	628,143	10,307,028
1900	2.5	339,874	13,789,242
1902	2.1	378,504	17,821,307

DECLINE IN CHARCOAL IRON PERCENTAGE.

"It will be noticed that in 1830 the percentage in the United States of charcoal iron to coke was 100 per cent.; in 1860, 30 per cent.; in 1890, 6.9 per cent., and in 1902, 2.1 per cent. The year of the greatest charcoal iron production in the United States was in 1890, namely, 628,145 gross tons, since which time it had dwindled to 222,422 tons in 1894. The year showing the largest production after this is 1902, namely, 378,504 tons.

"Michigan's best year was also 1890, namely, 230,769, or 36.7 per cent. of the total production of charcoal iron in the United States. Michigan has been growing in importance relative to the total production as will appear by the following table:

STATEMENT OF COMPARATIVE PRODUCTION OF CHARCOAL PIG IRON IN UNITED STATES.

Year.	Upper Peninsula of Mich.	Percentage of Mich. product.	Entire state of Michigan.	Percentage of total production.	Total production of U.S.
1850 [1858]	1,629				333,205
1860	5,660				278,331
1870	49,298	63.	77,536	21.5	365,000
1880	48,523	35.	137,879	25.5	537,558
1890	55,479	24.	230,769	36.7	628,145
1900	72,940	44.	163,712	48.	339,874
1902	80,451	51.	155,212	41.	378,504
1903 [Est.]	130,742	54.	239,758	[Est.]	

"This shows that whereas in 1880 Michigan's proportion was a little over 25 per cent.; in 1902 it was 41 per cent. The upper peninsula as compared with the whole state has increased from 35 per cent. in 1880 to 51 per cent. in 1902, and an estimate of 54 per cent. in 1903. Thus we see that while Michigan is constantly taking a more prominent position in the charcoal iron production of the country, the upper peninsula of Michigan is itself making like progress, and producing more and more of the charcoal iron of the state.

"It does not seem unnatural that Michigan should be the charcoal iron producing section of the United States, owing to its vast forests of hardwood being in close proximity to its iron ores, and the state has been the largest producer of any state in the Union commencing with the year 1873, Ohio having been in 1872 the first producer with 95,672 net tons, as against Michigan's product of 86,840 net tons.

MICHIGAN WILL HOLD ITS OWN FOR AWHILE.

"Although the production of charcoal iron in the country as a whole has declined since its high water mark in 1890, will in the future still further decline rather than increase, yet Michigan, and particularly the upper peninsula is likely to hold its own at least during the next ten years. I base this opinion upon the fact that the largest producers in the state have of recent years very greatly strengthened themselves by acquisition of large solid blocks of hardwood timberlands and by the construction of their own charcoal making plants, thus putting themselves in a position of running more steadily at a higher rate of production than they could in the past, when they had to depend upon more uncertain sources of fuel supply.

"The only country in the world which really holds its own in charcoal iron production is Sweden, now the largest producer. Its record for the last three years of which we have published reports is as follows: 1899, 497,727 metric tons [2204 lbs.]; 1900, 526,868 metric tons; 1901, 528,375 metric tons.

"Sweden is thus now the largest producer of charcoal iron, and as its iron industry depends entirely upon this kind of fuel, of which there is still a very large quantity remaining in that country, it will doubtless continue to remain the first producing charcoal iron country in the world. Sweden, however, does not depend to such an extent as we do in this country upon marketing its charcoal iron for castings, but on the contrary, the charcoal iron makers there are manufacturing a largely increasing percentage of their product into high quality steel.

INFLUENCE OF CHARCOAL IRON AND FORESTS.

"One cannot help being struck with the influence of charcoal iron production upon the forests of a country. For example, assuming that it has required 2½ cords of wood for every ton of charcoal iron made, we find for the product of Michigan up to the end of 1902, namely, 4,631,475 tons (gross) of charcoal iron, there was used 11,578.688 cords of wood, and if we assume that on the average there has been cut 35 cords to the acre, there will have been cut over for this purpose alone 330,820 acres of solid woodland. I do not think 2½ cords to the ton is far out of the way, as in all probability the average number of bushels to the cord has not much exceeded forty, and this would allow 100 bushels of charcoal to the ton of iron. At the present time the average number of bushels consumed per ton of iron in this state is probably about ninety, but in years gone by the amount necessary for a ton of iron was generally in excess of 100 bushels. A bushel in Michigan equals 20 lbs.

"In this connection it is also interesting to bear in mind that the amount of iron ore (most of which came from the state) used in making this total product of Michigan charcoal iron, calculating the yield at 54 per cent. from the ore used, amounts to 8,568,229 tons.

DIFFICULTY IN GETTING RELIABLE STATISTICS.

"The statistics for the production of the furnaces of the upper peninsula of Michigan are very incomplete, but by averaging the various sources of information, I assume that up to the close of 1902, the upper peninsula had probably produced about 2,000,000 tons of charcoal pig iron. As an instance of the difficulty of getting any reliable figures on this subject, would say that taking the figures from the annual statistical reports of the American Iron & Steel Association from 1872 to 1902 inclusive and Mr. A. P. Swineford's history of the Lake Superior district, (1876) for the figures up to 1872, I find the grand total of the production of Michigan to be 4,631,475, (which is the figure I have used above

in the calculation of cords of wood consumed and tons of ore used) but in endeavoring to find, however, what has been the production of each individual furnace, I have as far as possible gotten the figures from the furnaces themselves, and that failing, supplemented them by the publications of the mineral statistics of the state of Michigan and the Journal of the United States Association of the Charcoal Iron Workers for February, 1883, and adding the totals to the make of all the furnaces compiled in this manner, we find the grand total for the state is 4,178,218 or something like 453,000 tons less than the combined figures of Mr. Swank and Mr. Swineford.

"The above is simply given as an illustration of the difficulty of getting accurate statistics of the Michigan charcoal iron industry, and therefore it must be distinctly understood that all of these figures of product of iron are merely approximate, and likewise the calculation based on them as to the amount of wood and ore consumed. Nevertheless, in spite of the inaccuracy of these figures, these calculations are sufficiently close, I think, to make them interesting and to enable us to figure pretty closely upon its relationship to the timber and mineral interest of the state.

"Assuming, therefore, that the upper peninsula has produced 2,000,000 tons of charcoal iron up to the close of 1902, we find that there have been consumed in its furnaces 5,000,000 cords of wood, and that 166,666 acres of woodlands have been cut over. For the foregoing I am assuming that 2½ cords of wood have been used for each ton of iron made and that 30 cords has been the average secured from an acre or the yield of the upper peninsula. For the lower peninsula I would estimate an average yield in the past of 40 cords to the acre, as against 30 in the upper peninsula, making the average of 35 cords for the state. At the present time, however, I would estimate 2¼ cords of wood per ton of iron, and therefore for the estimated production in 1903 in the state of 239,758 tons there would be consumed 543,552 tons of ore, 539,505 cords of wood, and 15,414 acres of woodlands, and for the estimated production of the upper peninsula, namely, 130,742 tons, there will be consumed 241,392 tons of ore, 293,562 cords of wood and 9,785 acres of land cut over.

PRODUCTION OF UPPER PENINSULA TO BE INCREASED.

"The production of the upper peninsula will be increased next year by the fact that the new furnace at Marquette will then have been in continuous blast during the whole year, while in our calculations for 1903, she has only been producing for a brief time. It is therefore perfectly safe to say that the charcoal furnaces of the upper peninsula are clearing off 10,000 acres of woodlands per annum, or an average of about 30 acres per day, for 365 days in the year. This is clearing off a nice farm every day, and must aid very materially the process of adding to the population of the upper peninsula, the consummation of which is very desirable, as at present the whole population of the upper peninsula is approximately only three hundred thousand.

"I have been trying to get some reliable information regarding the number of acres of timberlands still uncut in the upper peninsula, but have been unsuccessful. The total acreage of the state (including the lakes) is set down as 36,704,000 acres, of which 10,419,840 is credited to the upper peninsula. According to the twelfth United States census, 1900, 67 per cent. of the state is woodland, namely, something over 24,000,000 acres. This, however, does not help us much as it does not differentiate between soft and hardwoods. Volume 13, No. 9 of the tenth census, of the United States, published in 1882 and 1883, page 551, on Forestry, reads: 'The estimated amount of 124,500,000 cords of hardwood is distributed over some 10,000,000 acres in the upper peninsula.' Estimating that the furnaces have been using 300,000 cords of wood a year since 1880, the twenty-three years to the close of 1903 would measure a consumption of 6,900,000 cords of wood, or say 7,000,000 cords, which if there were no other cause of consumption, would leave a balance of about 117,500,000 cords. It is, however, impossible from such meager data to make any calculations whatever as to the amount of cords of hardwood now existing in the state, as of course a vast amount of hardwood is used besides that which is consumed for charcoal. The fact remains, however, that in the upper peninsula today, the charcoal furnaces are doubtless consuming the wood cut from over 10,000 acres of woodland per annum, and fifty years' consumption at this rate would make 500,000 acres, which is not necessarily startling, when we consider the vast acreage of woodland doubtless still existing in the 10,000,000 acres of the upper peninsula, and the clearing of this land for the procuring of charcoal is today an unmixed boon in my opinion, to the upper peninsula, as it gives the settler a chance to buy cheap land in a section of the country which is now generally conceded to be unsurpassed for grazing and to possess very great advantages for many kinds of agriculture.

"Furthermore, to the owner of comparatively small tracts of woodland, desirious of clearing it for farming, the charcoal iron industry as at present established on the soundest kind of financial basis, enables him to always find a market for his cordwood at remunerative prices, whereas years ago the settler was obliged to cut down and burn up his fine logs and cordwood, in order to get them out of the way, receiving absolutely no remuneration, either for his labor or material.

ECONOMY IN SAVING BY-PRODUCTS.

"An interesting feature which should not be overlooked, is the increase in the saving of the by-products of the carbonization of wood of late years. To give one an idea of the size of this industry, I have secured some figures showing the amount of wood alcohol which is now being made in this state. In 1902 I estimate that there were 982,308 gallons of wood alcohol made, and during the first six months of 1903, 683,747 gallons, or at the rate of 1,307,494 gallons for the whole year, which at 60 cents a gallon, the 1902 price, equals $820,496.40. The increase, however, in the production of wood alcohol has been so great, not only in this state, but also in the whole country, (although the greatest increase has been in the state of Michigan) that the price during this year has already declined 25 per cent., and if this decline any further, it will result in the shutting down of many of the alcohol factories.

"The following table, which is admittedly incorrect, gives approximately the total production of pig iron by furnaces up to the end of 1902:

Upper Peninsula.	Tons.
Pioneer Furnaces	637,299
Collins Furnace	41,977
Northen Furnace	15,059
Bancroft Furnace	55,608
Morgan Furnace	56,563
Champion Furnace	31,048
Michigan Furnace	40,511
Greenwood Furnace	40,202
Fayette Furnace	229,288
Munising Furnace	28,312
Munising Furnace, Onota	50,706
Deer Lake Furnace	93,579
Marquette & Pacific R. M. Co.	38,859
Grace Furnace	11,346
Carp River Furnace	83,500
Excelsior (Peat) Furnace	68,634
Menominee Furnace	59,553
Escanaba Furnace	8,048
Martel Furnace	58,349
Vulcan Furnace	73,829
Gogebic Furnace	3,700
Manistique Furnace	150,904
Florence Furnace	5,400
Total Upper Peninsula	1,882,274

Lower Peninsula.	Tons.
Michigan Central Iron Co.	42,998
Bengor Furnace Co.	120,957
Peninsula Iron Co.	217,632
Eureka Furnace	185,183
Leland Furnace	10,082
Frankfort Furnace	13,917
Elk Rapids Furnace	444,544
Detroit & L. S. Iron Mfg. Co.	78,691
Union Iron Co.	129,503
Spring Lake Iron Co.	405,934
Detroit Iron Furnace Co.	133,086
Gaylord Iron Co.	97,262
Antrim Iron Co.	369,903
Pine Lake Iron Co.	40,252
Total Lower Peninsula	2,295,944
Total for state of Michigan	4,178,218

"This shows that the largest production in the upper peninsula has been reached by the Pioneer furnace, commencing with the year 1858, and including the make of the company's more recently built plants at Gladstone and Marquette, but not including the Carp furnace, which is now operated by the Pioneer Iron Co. The product of the Pioneer furnaces as above is calculated to be 637,299 tons. The only other two furnaces in the upper peninsula which have produced over 100,000 tons, are the Fayette furnace, estimated at 229,288 tons, and the Manistique furnace, estimated at 150,904 tons.

"With regard to the prices that have prevailed on charcoal iron, I regret to say that the same difficulty presents itself of obtaining correct figures as respects the Lake Superior product. The census reports give certain figures, and the records which we have preserved in the office of the Cleveland-Cliffs Iron Co. taken from the Pittsburg papers, also give figures running many years back, but they are unfortunately mixed up with the prices of iron made in Ohio, New York and the South, many of which were cold blast irons, and therefore not to be used as indicating the price of the warm blast irons of the upper peninsula. I have, however, an interesting letter from Mr. Solon Burt, of the Peninsula Iron Co., which gives some prices which prevailed for the Peninsula Iron Co.'s iron from 1864 to 1873 inclusive, namely:

"'Detroit, Mich., Aug. 13, 1903.

'Mr. Wm. G. Mather,

'Cleveland, Ohio.

'Dear Sir:—From inspection of Peninsula Iron Co.'s books, I would say that their sales would average about as follows, for years given: 1864, $70, minimum $60, maximum $76; 1865, $50; 1866, $50; 1867, $48; 1868, $42; 1869, $44; 1870, $40; 1871, $37.50; 1872, $55; 1873, $55.

'In 1874 few sales were made, but it would average up about $40 per ton. I have not gone further than 1874 as I presume you have statistics that are quite reliable from about 1875. Previous to 1864 I have little knowledge of the charcoal iron business. As

I remember, when the Morgan Iron Co. was building its furnace in 1863, they were figuring on being able to sell at $18 per ton. I think, however, that must have been at Marquette, as the freight down in those days was probably three or four dollars per ton. Gay and Case has pretty hard work to keep their furnace running and meet obligations. I think Gay was so hard pressed that he had to turn his iron over to the bankers to get funds. I think the same was the case with Dr. Russell here in Detroit.

'Yours truly,

'SOLON BURT.'

"Mr. Peter White thinks that the highest price at which he ever sold any charcoal iron was in war time, for 300 tons Nos. 3, 4 and 5 Bancroft he received $85, $90 and $95 respectively for the three grades.

"Since 1873 the last price furnished by Mr. Burt I find nothing upon which I can absolutely rely until we come to the records of the Cleveland office of the Pioneer Iron Co., commencing with 1891, which are as follows, F. O. B. furnace: 1891, $16.57; 1892, $14.97; 1893, $15.45; 1894, $13.71; 1895, $12.09; 1896, $12.12; 1897, $11.41; 1898, $10.26; 1899, $12.24; 1900, $19.78; 1901, $16.48; 1902, $17.74.

"As showing the relative values of Lake Superior charcoal iron with coke iron, the United States census figures of 1900 are interesting. For the state of Michigan in 1880, the average price of charcoal iron was $29.25 and of all iron in Pennsylvania, (mostly coke, of course), $26.08. A difference in favor of charcoal of $3.17. For 1890, the prices were $19.58 and $17.31, respectively, a difference in favor of charcoal iron of $2.27. In 1900, the prices were respectively $16.46 and $14.98, a difference of $1.48 in favor of charcoal.

"These figures showing the decline in the relative value of charcoal iron as compared with coke iron in the United States, tell the story as to why charcoal iron does not increase in production, either relatively or absolutely.

GREAT ASCENDANCY OF COKE IRON.

"Whereas, the total production of the United States in 1860 of charcoal iron was about 278,000 tons and of coke about 919,000 tons, in 1902, charcoal was 378,000 tons and coke iron 17,821,000 tons. You see, therefore, that it is insignificant as compared with coke iron, and yet in the history of our Peninsula, it is of interest and importance incommensurate with its bulk as compared with coke iron produced in the United States. This is especially the case with us who are intimately connected with the production of Lake Superior iron ore. The production of charcoal iron and the mining of iron ore practically grew up as twins in this country.

"In June, 1845, the Jackson Mining Co. was organized at Jackson, Mich., and in the summer of the same year secured possession of the now celebrated Jackson Iron Mountain. The ore secured therefrom was tested in a forge with a charcoal fire in 1847. A forge on Carp river, near the Jackson mountain was finished in 1848 and the first lot of booms made at this forge from Lake Superior iron ore was sold to the late E. B. Ward and from it was made the walking beam of the side wheel steamer Ocean. It is true that about the same time some Lake Superior ore was shipped to the furnaces in the Shenango valley of Pennsylvania and there tested with coke, but at the same time we Lake Superior men should not forget that much of the development of this Peninsula has been due to its iron ore coupled with its charcoal. The site of the old Jackson forge is an historic spot and worthy of being commemorated by a monument. The old charcoal furnaces whose remains now survive only to indicate the primitiveness of the industry and the energy of its promoters as late as less than fifty years ago should be objects of interest to all who are connected with the development of the mineral interests of this country. One can wander into the wild portions of this country today with the idea perhaps that few have penetrated to that particular place before, and suddenly come upon a battery of old ruined kilns, log houses, embankments and roadways, the latter having served the purpose of a tramway for transporting the charcoal and wood, and you are surprised to find in a trackless wild these evidences of an old industry, which has for years been extinct in that place altogether, although we know that the country itself has only been settled by white men for a little over fifty years."

Of those who are living who were identified with the early furnaces, Mr. Mather mentions the following: Solon Burt, now with the Peninsula Iron Co. of Detroit; Noah W. Gray, now manager of the Carp furnace; W. H. Nelson, now manager of the Manistique furnace; William Gerhauser, now manager of the Superior Charcoal Iron Co. of Grand Rapids, Mich., which handles more charcoal iron than any other company in the world; Frank B. Gaylord, now in charge of the Deseronto Iron Co.'s furnace at Deseronto, Ont.

After the coal cargo of the steamer C. S. Parnell had been unloaded in the south branch of the Chicago river this week part of a propeller wheel was found sticking through the hull below the water line, five oak planks having been cut through by the big piece of steel. All that kept the Parnell from filling with water through the rent in her sides was the fact that the section of wheel remained and filled the cavity. The piece of the propeller found in the Parnell is from the passenger steamer North Land, left there when the two boats rubbed together in the lower river last Saturday afternoon.

AROUND THE GREAT LAKES.

Barge No. 91, belonging to the Standard Oil Co., was wrecked on the coast of New Jersey last week with a cargo of petroleum. She was built on the great lakes and was formerly the schooner Loyalty.

The license of Capt. A. T. Stannard has been suspended for sixty days for refusing to give passing signals to the government steamer at Cleveland, used by Maj. Dan C. Kingman, government engineer.

The steamer James H. Hoyt has broken her own loading record. At the Great Northern docks at Superior last week she took on 5,400 tons of ore in 30 minutes and 30 seconds. She has twenty-one hatches.

Work has been begun by Stang & Little at Lorain for the extension of the berth upon which the Wolvin 560-footer is to be built. The city has given permission to the ship building company to extend the berth into the river.

The new steamer John C. Howard, built by the Columbia Iron Works for the George Hall Coal Co. of Ogdensburg, has been turned over to her owners, who filed a bond of $20,000 pending a settlement of the ship building company's affairs.

Capt. Frank Dority of the Goodrich liner Georgia has been put in command of the new steamer Eastland of the Michigan Steamship Co.'s fleet, vice Capt. John Perue resigned. Edward Carus and Neil Gallagher will be first and second mates under Capt. Dority.

The steamer Thomas Davidson, bound from Ashland to Cleveland, with a cargo of iron ore, stranded 5 miles east of Eagle river last week in a dense fog, running out 18 in. on a gravel bottom. Part of the cargo had to be jettisoned before she could be got off.

Congressman J. E. Ransdell of Louisiana is making a tour of the lake district. He is a new member of the rivers and harbors committee and his purpose is to become acquainted with a department of his work which is new to him. He says that the commerce of the great lakes has impressed him greatly.

The steamer Veronica, having the schooner Fassett in tow, ran on the rocks at the entrance of Niagara river in a dense fog on Tuesday of this week. A collision between the two vessels

Abram Smith & Co., Algonac, Mich., send the accompanying photo of the blowing up of the schooner Champion in St. Clair river, opposite Algonac, by Capt. John Quinn. One hundred pounds of dynamite were used in the explosion.

was narrowly averted when the Veronica struck. Both are ore laden for Tonawanda. The Veronica is out 3 ft. forward and her cargo must be lightered.

The Manitowoc Dry Dock Co., Manitowoc, Wis., has just finished the tug Burger for John Coffey. The tug is 88 ft. long, 17 ft. beam and 8 ft. deep. Her machinery was built by the Sheriffs Mfg. Co., of Milwaukee, her engine having a cylinder 18 in. in diameter with 20 in. stroke, fitted with independent air pump and condenser. She is considered one of the finest fishing tugs on the lakes.

While attempting to back into a slip at Huron the steamer City of London struck one of the McMyler ore conveyors last week, completely wrecking it. Through a misunderstanding of signals the engineer backed the steamer strong instead of going forward. She struck the front leg of the machine, throwing it to the ground. A portion of the steamer's after upper works was carried away and her quadrant and propeller were damaged.

Nothing of special interest was done at the meeting of the Lumber Carriers' Association held at Detroit on Tuesday. William Penje, secretary of the Lake Seamen's union, was present and made a short address, saying that the union was trying to live up to its agreements and hoped the owners would do likewise. C. W. Kotcher, the Detroit member of the Lumber Carriers' Association, agreed through his representative to employ only union labor and to pay the union scale.

A Quebec dispatch says that the federal marine court, in its finding on the wreck of the tug Mersey, in which five of the crew were drowned on Aug. 13, severely condemns Capt. Gagnon for seizing the only lifeboat on board and deserting the tug, leaving the five men without means to save themselves. Mate Barras is also found guilty of "disgraceful cowardice" in being a party

to the desertion. In the case passed upon three men left the tug in the only small boat available, leaving their five comrades to go down with the wreck.

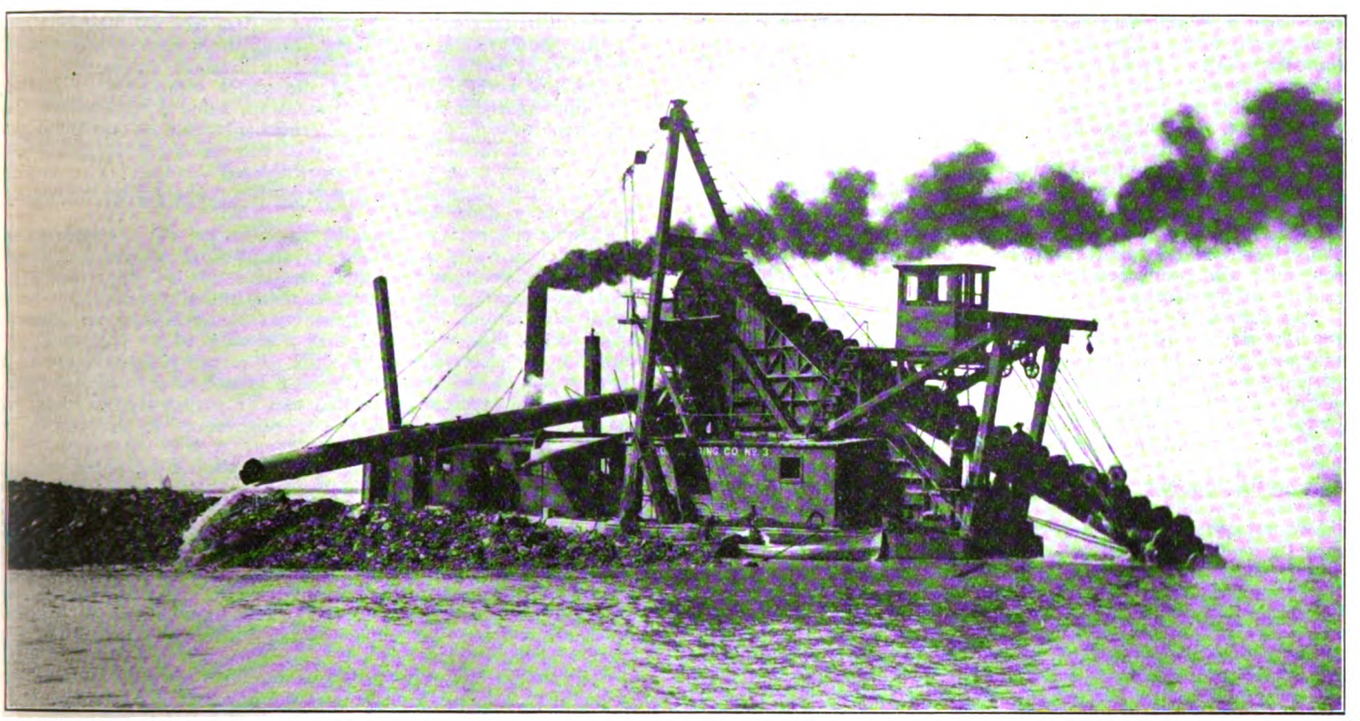
The first wireless telegram ever sent to Chicago from Lake Michigan was delivered shortly before noon on Friday last to President James H. Graham of the Graham & Morton Line. The message was dispatched from the steamer City of Milwaukee, twenty-five miles from shore and was caught at the station in the tower of the Montgomery Ward building and delivered to Mr. Graham two hours before the boat steamed into port. For a month experiments in wireless telegraphy by the De Forest system have been in progress on the sidewheel steamers City of Chicago and City of Milwaukee, but not until Friday last have the instruments on shore and on the vessels been alike responsive to the electric impulse. Complete success marked the trials, however.

Captains of vessels who would avoid trouble on their craft must be extremely polite in giving orders. This latest union rule was brought forcibly to the attention of the captain of the steamer Hiawatha. When his steamer was on the way up the lakes last week, the wheelsman, believing the captain had used unnecessarily strenuous language to him in directing the course of the ship, packed up his dunnage and left the ship at Detroit. He was followed ashore by several of the crew, and the union refused to send men in their places, compelling the Hiawatha to go to Milwaukee shorthanded. As soon as the steamer reached Milwaukee the union officials ordered the entire crew to quit. In order to keep his boat in commission the captain called at the union headquarters and explained that he had not sworn at the wheelsman, but had merely asked him civilly to hold the wheel steadily. The explanation was satisfactory and the crew were ordered back to the steamer.

Notice is given that on or about Sept. 15 a fixed white lens-lantern light, illuminating the entire horizon, will be established, 36¼ ft. above mean lake level, in the structure recently erected on and about 23 ft. from the southerly end of of the new south breakwater, northerly side of the main southerly entrance to the harbor of Buffalo, northeasterly end of Lake Erie. The structure is of iron, bottle shaped and painted white. On Sept. 15 also a light of the fourth order, illuminating the entire horizon, and showing one red and two white flashes alternately, interval between flashes ten seconds, will be established in the structure recently erected on and about 23 ft. from the northeasterly end of Stony Point breakwater, southerly side of the main southerly entrance to the harbor of Buffalo, northeasterly end of Lake Erie. The focal plane of the light will be 52¾ ft. above the mean lake level and the light will be visible in clear weather 15 miles, the eye of the observer 15 ft above the lake. The structure is an iron covered tower, lower part cylindrical, and painted reddish brown, upper part conical and painted white, surrounded by a black cylindrical lantern.

The steamer Robert R. Rhodes with the barge Gregor in tow had a hard time of it in the gale on Lake Superior last Saturday. They finally made the port of Marquette full of water and with the crews exhausted from steady work at the pumps. All of the crew wore life preservers, so imminent was the peril. The two boats left Duluth Friday with cargoes of iron ore for delivery at Lake Erie ports. As the vessels proceeded down the lake the northwest storm set in, and when Keweenaw point was rounded the seas were rolling mountains high. Fearing to expose the broadsides of the heavily laden vessels to the storm in an effort to reach a haven of safety along the south shore, the captain of the Rhodes held his course directly into the teeth of the northeaster. Unable to make headway or hold his own against the gale, he finally decided to run for this port. Once in the trough of the sea, the waves threatened to engulf the two vessels. The upper works on both boats were crushed in by the weight of water thrown against them. Early Sunday the distress signals of the Rhodes were heard off Marquette port and the tug Wisconsin hurried to the assistance. The small craft with great difficulty managed to bring the Gregor into port, while the Rhodes, freed of her burden, reached the shelter of the breakwater.

At a wage conference held at Chicago on Wednesday of this week dredge workers on the great lakes were refused a general increase in pay. Leaders of two international labor bodies in conference with the executive committee of the Dredge Owners' Protective Association learned that the demands of the workmen threatened a cessation of harbor work throughout the lake system, because with the increase desired contractors cannot keep their estimates within those made by government engineers. Improvements to cost $10,000,000 may be delayed by the trouble over the dredgers' pay. In addition to urging caution on the labor leaders concerning wage demands the owners' association declined, through its executive committee, to use the power of the association to compel its members to raise wages. Wage increases have been granted at several Lake Erie ports, and the owners would not commit themselves to further increases now. President Daniel J. Keefe and Secretary T. J. Dolan represented the unions of longshoremen and dredge workers. Representing the big dredge owners of the lakes were President W. A. Lydon, T. C. Lutz and C. J. Connell of Chicago; S. O. Dixon of Milwaukee; James Smith of Cleveland; E. T. Williams of Duluth, and P. B. McNaughton of Buffalo. The meeting ended with an agreement between the labor representatives and employers leaving the wage matter in abeyance for the present.



Buffalo Dredging Co.'s Elevator Dredge at Work on the Buffalo & Susquehanna Iron Co 's Canal at Buffalo, N. Y.

Capt. Edward Nathan Burton, probably the oldest of all the lake captains, died last week at the home of his daughter, Mrs. H. L. Proctor, at Ogdenburg, N. Y. Until five years ago Capt. Burton made his home with his son in Duluth, but in 1898 removed to his daughter's home in New York state. Capt. Burton was born on Aug. 30, 1814, so that at the time of his death he was 89 years old. His career as a vessel commander began in 1832, when he was 18 years old and he assumed the duties of captain of a small ship, at that time. Since then and until 1886, he was engaged in sailing the lakes and became famous as a contemporary of Capt. Bradley of Cleveland. The names of Bradley and Burton were equally well known at the eastern end of the lakes. During his last years of service, Capt. Burton was engaged on a revenue cutter. He was pilot for the steamer Chase at the time he decided to retire. Early in his career Capt. Burton was engaged in the trade on Lake Ontario and at that time sailed one of the largest vessels afloat on the lakes, capable of carrying 8,000 bushels of grain. Since then, vessels have been built which are engaged regularly in the lake trade which will carry that many tons of freight. Capt. Burton is survived by three sons, J. K. Burton of Duluth; George R. Burton of Ishpeming, and Charles E. Burton of Joplin, Mo., and one daughter, Mrs. H. L. Proctor, of Ogdensburg, N. Y.

Size and Character of American Battleships.

GEORGE W. MELVILLE, Rear Admiral, U. S. N., Retired, in American Industries.

The extended courtesies recently received by our European squadron of warships from the leading officials of the German and British admiralties is substantial evidence of the fact that our navy is regarded as representative of this nation's purpose and strength. It was a gracious act upon the part of Emperor William and King Edward to take part personally in this welcome, and there is no doubt but that such action will improve our diplomatic and commercial relations with both countries. The work of the navy, therefore, stands for something more than routine military drills. Its sphere of usefulness is even broader than that of training sailors for future needs.

The navy is doing a great work in showing to rival powers our advance in naval construction, our ultimate intention to compete for a fair share of the commerce of the world, and our determination to prevent the closing of markets that have been open to us for a hundred years. The spirit of the nation is likewise reflected in the carriage and deportment of officers and men doing duty on board the warship. It is certain that friend and foe secure a more comprehensive and better realization of our military spirit and strength by personally noting the stature and character of the crews of our warships than by perusing official pamphlets or analyzing census statistics.

Probably no industrial organization in the United States has a greater indirect interest in the character and size of our navy than the National Association of Manufacturers. The warship has always gone in advance of the merchantmen. The expeditions to Japan and Korea are probably the best known of the commercial services performed by our navy, but many illustrations could be given as to the splendid work performed by individual commanders and single ships in making known to our merchants and manufacturers the trade possibilities in distant portions of the world.

By reason of the special interest and knowledge of naval affairs possessed by President Roosevelt, it can be expected that our naval strength will be greatly augmented so long as he is commander-in-chief of the service. Fortunately for the interests of the navy and nation, the demand for an increase in naval strength is not confined to any one political party or to any section of the country. While we probably now rank fourth in actual naval strength, it is probable that within ten years we shall advance to the second place. It is certain that we shall have a more powerful navy, and thus there devolves upon naval administrators and experts the responsibility of carefully scrutinizing the character of naval construction that has been suggested by various persons and interests. It is now evident that the friends of the navy should be fully satisfied with the extent of the construction that is likely to be authorized, and as it will not be necessary to arouse public sentiment to the importance of providing for an increase, it should be fully understood that the prestige and influence of the navy will be sacrificed unless the character of the construction will stand the test of time and actual service.

The battleship must ever constitute the principal strength of a nation that aspires to sea power or maritime supremacy, for there must always be a navy to support a commercial marine. Auxiliary war vessels and naval stations are essential as supports and feeders to the battleships. These auxiliaries are of such extensive nature that a careful estimate shows that for every battleship constructed it will be necessary to spend twice the cost of such ship in the maintenance of the service, and in the building up of navy yards, dry docks, coaling stations, cruisers, scouts, supply vessels, colliers and torpedo craft. The modern battleship of the most satisfactory size, including armor and armament, represents an expenditure of about seven and a half million dollars. The cost in Europe of building such a vessel will probably be from 25 per cent. to 30 per cent. less. The actual expenditure thus involved in building each battleship, with the subsequent cost of maintenance of personnel and material, will be over $20,000,000. It will be thus seen that the actual cost of construction forms about a third of the cost of the maintenance of a naval establishment. It is therefore bullion, as well as brain and brawn, that will help decide the question of sea power, and already two continental powers that aspired ten years ago to naval supremacy have hopelessly given up the race by reason of the excessive expense involved in modern naval construction.

About two years ago a distinguished British admiral raised the question as to whether the latest-designed type of battleship was not too large. This query coming from such an authority as Admiral Hopkins, who raised the question, commanded unusual attention. The subject was thoughtfully studied by various naval experts and administrators before a final decision was given. As the ships were being increased in size each year, it was realized that the question of a halt in size of construction should be specially investigated. The admiralty thus made it a matter of special study, and its conclusion was a decision to increase rather than decrease both displacement and speed.

It should be incidentally stated that the modern battleship is but a development of the monitor of forty years ago. The displacement has progressively increased from 3,000 to 16,000 tons. The weakness of the monitor type was simply due to the fact that there was too much armor and armament for the displacement. It has been found that by progressively increasing the displacement and horse power that there could be secured greater offensive and defensive properties. The radius of the ship has been extended and the speed increased by enlarging her size. An increase in displacement has secured more comfortable quarters for the men, and permitted the installation of many appliances such as ice machines, heaters, bake-ovens, cooling rooms, bath rooms and other necessary conveniences. There has also been secured sufficient space for the installation of larger auxiliaries and well-appointed machine shops, and thus the warship with each progression in size has become more self-sustaining in regard to repair, while her ability to keep at sea has been extended. Every advance of size in naval construction has given us a better warship, and any decrease in displacement will be nothing more than retrogression.

No naval question has ever yet been seriously propounded in Great Britain or on the continent that has not found an echo in this country, and thus a year after the question was disposed of in Great Britain the subject was brought up in the United States. A careful reading of the paper submitted by Admiral Hopkins with the attendant discussion, when compared with the argument advanced by the American advocate of small-size battleships, will show the similarity of the views set forth and even of the words used for the contemplated change. The response of the British admiralty to the proposition should be the response of our navy department.

Since the cost per ton of displacement of a battleship, including armor and armament, is about $450, it was but natural that the proposition to reduce the size of the ships should appeal very strongly to influential men in both senate and house naval committees. By reducing the battleships from 16,000 to 13,000 tons they were told that a saving of at least $1,000,000 ought to be effected in each ship. But every manufacturer and builder knows that the first saving is not always ultimate gain, and that the greatest waste that can be perpetrated is to build a machine or appliance that is not quite equal to the service for which it was designed.

The question as to whether there should be a reduction in the size of the battleship was thus brought to an issue last winter during the closing days of the congress. The board on construction of the navy department unanimously recommended large battleships, and this recommendation was supported by the house naval committee. The senate naval committee, however, inclined to the opinion that the smaller battleship was most adaptable to our needs. The matter was compromised by the congress authorizing the construction of three large-size and two small-size battleships.

No nation has ever yet been able to make eighty cents' worth of metal pass as a dollar beyond the borders of its own country. As long as such a coin is but a certificate, and there is an actual dollar on deposit for its redemption, the coin will pass current for its face value anywhere. The actual value of the coin becomes apparent when there is a financial crisis, and when the demand for its redemption is made. And thus it was with the small battleship—it was easy to make a paper promise that upon a certain displacement there could be designed a ship that would be equivalent of the larger one, but when actual plans were prepared it was found imperative to sacrifice either armor, armament, speed or radius of action. No one has ever been able to put five pints into a quart measure, and no naval expert will ever be able to give us the fighting value from a ship of 13,000 tons that can be secured from one of 16,000 tons. It is therefore proposed to sacrifice speed and radius of action, so that more armor and armament can be installed.

In support of the doctrine of sacrificing speed and radius of action it is asserted that it has never been the policy of this country to build ships whose principal characteristic was that they could run away from the enemy. We have always built fast ships, however, and always will—not for the purpose of running away from the foe, but for the purpose of finding the enemy. The fast ships cannot only reach the battle line, but they can remain there, and it is a delightful fancy which pictures our possible foes as permitting one of our admirals with a fleet of slow ships to determine the time and place of battle. It has always been a military maxim that the military force which is the swiftest in movement always secures the military point of vantage, and the slow ship will seldom be on hand when wanted.

Not only the ship building firms but the manufacturing interests of the country are deeply concerned in this matter, for it is certain that if there is any retrogression in the character of the construction of our warships, it will materially impair our manufacturing, commercial and maritime prestige. The material wealth of this nation justifies us in building the best of battleships, and the proposition to substitute a vessel of 13,000 tons displacement for one of 16,000 tons should only receive favor at the hands of a nation whose financial budget is far from satisfactory. The building of such types of ships is simply a financial confession upon the part of any country that the race for naval su-

premacy is too costly, and that the financially embarrassed power hopes that some streak of luck will aid its weaker ship in securing victory.

The attempt to crowd too many and too heavy guns on the smaller ships will result in damaged mounts and emplacements, for there is a limit as to the amount of recoil which the frames of any vessel can withstand. Then, again, the crowding of the guns will make it impossible to insure a reliable and rapid ammunition supply. The tendency of the times is to cut down the impedimenta carried by the soldier, and the same course should be pursued with the battleship. It is not the number and size alone of the guns which will determine her capacity for offensive work, but the endurance of the mount and the facility for operating the guns, as well as the means for securing a rapid supply of ammunition, will likewise be important factors.

It means much to the industrial world of America as to the character of the warships that we shall send abroad. The attempt to make a 13,000-ton ship do the work of a 16,000-ton vessel is simply another illustration of attempting to convince a manufacturer that a $400 machine tool is as good as a $500 one. Every manufacturer knows that the cheaper article is either inferior in workmanship or has a less range of action.

In this article I have not attempted to show the tactical and strategical reasons why this nation should build the larger vessels. The principal purpose has been to show that the proposition does not even commend itself along business lines, and that the construction of such vessels will not only materially reduce our fighting strength, but seriously handicap the American manufacturer and exporter in his patriotic effort to extend the sale of American products. It is not likely that foreign nations will be impressed with the superiority of our manufactured appliances if we first have to make excuses for the character and design of the warships that are within their ports.

MARINE BOILER REGULATIONS.

The text of the regulations governing the construction and inspection of marine boilers, as revised by the board of supervising inspectors of the steamboat inspection service, will be transmitted within a few days to Secretary Cortelyou by Supervising Inspector General Uhler, and the new code will then be subjected to very careful scrutiny before it is finally promulgated. This will afford an opportunity to the boiler manufacturers of the country and especially to the legislative committee of the American Boiler Manufacturers' Association, which has the matter in hand, to take up with the department the question as to whether the secretary will unite with the association in urging upon congress the passage of a bill similar to that presented at the last session providing for the appointment of an expert commission to revise the laws and regulations relating to boilers. Secretary Cortelyou has thus far given the matter no attention and will not do so until the text of the new code is laid before him.

As a result of vigorous representations made by several boiler manufacturers, and especially by the W. & A. Fletcher Co., of Hoboken, N. J., Gen. Uhler has made an important ruling with regard to boiler construction, which removes one of the principal objections urged against the existing code by the committee of the American Boiler Manufacturers' Association. This point relates to the relative strength of the shell and bracing of a marine boiler, as to which the existing code of regulations requires that all braces shall be of not less strength than the shell, without regard to the pressure which the boiler is required to stand.

The attention of the supervising inspector-general was drawn in this connection to a specific case of a boiler built for a ferry boat which the local inspectors and the supervising inspector of the district had refused to pass because the shell exceeded in strength the braces, although the braces were fully equal to the pressure at which it was desired to use the boiler. In this case the boiler was double riveted, which under the regulations entitles it to 20 per cent. increase of pressure, but although no claim for such increase was made, this fact was held to prevent the approval of the authorities because there was no corresponding increase in the bracing. After considering carefully the reports of the inspectors and the representations of the manufacturers, Gen. Uhler made the following comprehensive ruling:

"Your letter appealing from the verbal ruling of the United States local inspectors and supervising inspector of the New York district in relation to the building of a boiler for the ferry boat Jamaica, the shell of which boiler you propose to make of flange steel, and to brace as shown on the blue print, is at hand, and in reply would say that the refusal of the local inspectors at New York to approve this boiler, unless all parts have the strength of the shell, is based upon which I believe is a mistaken interpretation of the statute, and which interpretation explains the positive stand assumed by the local inspectors at New York.

"My understanding of the statute justifies the conclusion that the provision 'that all other parts of such boiler shall correspond in strength to the additional allowances so made,' clearly implies that where the claim of 20 per cent. additional pressure for double riveting of the longitudinal laps of the cylindrical parts of such boilers was allowed, then all other parts must have corresponding strength to that of the shell, but as no claim was made for any allowance, and no allowance considered, it is obvious that there is nothing contained in the statute upon which to base the demand that all other parts shall have the same strength as the shell, and I must decide that the interpretation of the statute referred to by the local inspectors at New York and concurred in by the supervising inspector of the second district is not in accordance with the purpose nor the phraseology of the statute, and the restrictions cannot be justified. All boilers should be allowed working pressure in accordance with the strength of the weakest part, without reference to the strength of the shell, and all the local inspectors will be so notified."

The decision above rendered will be highly gratifying to boiler manufacturers throughout the country, who have found it extremely difficult to comply literally with the requirements of the regulations as heretofore construed. It is understood that in the revision made by board the regulation has been amended so as to relieve it of all ambiguity.

THE SHIPPING TRADE IN CHINA.

Statistics relating to the maritime movement in Chinese ports during the year 1901, emanating from the German consulate at Canton, have been published at Hamburg. The clearances of steamers in the port of Canton numbered 3,002, representing a total measurement of 1,879,651 registered tons, the share of the different flags in this traffic being as follows:

Flag.	Ships.	Tons.	Flag.	Ships.	Tons.
British	1,796	1,554,966	Japanese	9	9,783
German	124	144,718	Norwegian ..	12	10,887
Chinese	920	104,408	American ...	20	23,724
French	121	31,165			

A great part of the traffic under the British flag falls to the regular line of steamers registered in Hong Kong, which dispatches two boats daily from and to Hong Kong, as well as several boats every week to Macao and Foochowfoo. The German flag ranks next after the British, by reason of the regular services to ports on the Yang-tse and to Chefoo and Newchwang. The third place is taken by the Chinese flag—for the most part by the boats of the China Merchants' Co. The vessels appearing in the list as American also belong to this company, some of its vessels having been put under that flag at the time of the disturbances in 1901. The French flag was much more in evidence in Chinese waters in 1901 than in 1900. In the last named year only two clearances, representing 14 tons, were made under the French flag, while in 1901 there were 121 clearances, representing 31,165 tons. This important progress was effected by the employment of a French steamer regularly between Canton and Hong Kong, and another from Canton to Kwangchow, supported by state subsidies. In the course of the year an agency of the Japanese Mitsui Bussan Kaisha was established at Canton, and in the same year the representation of the Austrian Lloyd at that port, hitherto in the hands of an English firm, was transferred to a German house.

Inland navigation in China is a very extensive business, as will be seen by the following figures showing the number and tonnage of vessels cleared from places situated on the inland waterways in 1901:

Flag.	Ships.	Tons.	Flag.	Ships.	Tons.
Chinese ..	32,612	1,341,693	French ...	8,521	139,779
British ..	30,714	700,850	German ...	248	2,376

The major part of this inland traffic is therefore in Chinese hands. The steam shipping trade of the West river—which has been carried on under different regulations from those affecting the inland waterways—extends really up to Foochowfoo. Vessels in this service are privileged to ship both passengers and cargo at the stopping places, and hitherto the British flag is the only one participating in it besides the Chinese. The traffic between Canton and Hong Kong forms the most important part of the river navigation. According to returns made by the Hong Kong harbor authorities, 20,602 sailing-ships, representing altogether 666,248 register tons, cleared in and out at Hong Kong in this service in 1901, and the number of passengers conveyed to and from Canton is about a million every year. Up to a recent date (the German consul states) the steam shipping trade was almost entirely in the hands of the (British) Hong Kong, Canton and Macao Steam Navigation Co., but now a number of small steamers have been put on by (for the most part) Chinese companies. One of these is the China Steamship Co. of Canton and Hong Kong, Ltd., and another new undertaking is the Shiwo Steamship Co., and an increasing number of French steamers is also expected to compete in those waters.

Apart from the Canton-Hong Kong traffic, the most active sphere of foreign steamships is the trade between different ports on the Chinese coast. As far as most of the northern ports are concerned, the British flag takes the greatest share in this trade. The shares of the various flags in some of these services are thus stated:

	Brit.	Ger.	Norw.	Amer.	Jap.	Chin.
Shanghai-Canton	148	52	1	19	1	—
Chingkiang-Wuhu-Canton .	63	17	2	—	—	—
Tientsin-Canton	21	6	—	—	—	—
Newchwang-Chefoo-Canton	29	35	7	1	6	1
Hongay-Canton	—	11	1	—	—	—

The shares of foreign flags in the coasting trade between southern Chinese ports and to and from ports in French Indo-China in 1901 were:

	Hoihow-Kiungchow.		Pakhoi-Lienchow.	
	Ships.	Reg. tons	Ships.	Reg. tons.
French	488	302,208	183	99,098
German	404	296,054	88	62,446
British	66	58,574	32	27,140

SUBMARINE NAVIGATION.

"Submarine Navigation" is the title of a two volume work by Mr. Allan H. Burgoyne, and it goes very thoroughly into submarine navigation both from the historical and scientific standpoint. Especially is it interesting in its historical features. About half of the second volume is devoted to an investigation of the Holland submarine boats and the rest to a consideration of the theory of submarine navigation. Submersion, stability, form, orientation, direction, security and habitability and motive power are all discussed. The military and tactical value of the submarine are also considered.

Although submarine navigation—the word navigation being used in the strictest sense—was not attempted until A. D. 1620, several inventors are known to have made descents beneath the surface of the sea for the purpose of exploration. Alexander the Great used diving bells with some success in the siege of Tyre, 332 B. C., but nothing is known concerning their mode of descent or the manner of sustaining life therein. An Arabian historian named Bohaddin, living about A. D. 1150, relates that a diver entered Ptolemais during a siege by means of a submarine apparatus. In 1538 an invention for descending into the sea was heard of at Toledo, and Charles V. is said to have interested himself in it. Forty-two years later an Englishman, William Bourne, devised a plunging apparatus, which in outward form resembled that constructed by another Englishman, Symons, about 1747, but the means employed for submersion were different. Bourne submerged his vessel by contracting its size by means of a number of hand vises, and thus reduced its volume. Twenty-five years afterward Magnus Pegelius launched a similar craft, which was regarded as a marvel in its time. None of these early experiments, however, deserve much attention in a history of submarine navigation, the structures to which we have referred, being for the most part simply suspended from vessels, as is the case with the diving bells of today.

The honor of having fashioned the first submarine boat belongs to Cornelius Van Drebel, a Dutch physician. His first experiment was made in 1620, when he built and launched a navigable submersible boat that proved so successful that he had two other vessels constructed on the same plans, in the larger of which James I., of whom Van Drebel was an intimate friend, made a long trip. These early crafts were built of wood, and rendered watertight by greased leather stretched all over the hull. According to a nearly contemporary description of the largest of these submarine boats, she carried twelve rowers besides passengers, and made a journey of several hours, at a depth of from 12 to 15 ft. The holes for the oars were made to hold the water by leather joints. Drebel accounted his chief secret to be "the composition of a liquid that would speedily restore to the troubled air such a proportion of vital parts as would make it again for a good while fit for respiration." The composition of this liquid for enabling air to be used again was never made public. Drebel died in 1634, without having completed his experiments, and left behind him no document relative to his work on the subject.

NORWOOD TAKES OUT FIRST PATENT.

In April, 1632, one Richard Norwood took out a patent for a submarine invention in which he proposed "making and using engines or instruments for diving and for raising or bringing out of the sea and other deep water any goods lost or cast away by shipwreck or otherwise." He was the first to patent an idea relative to submarine navigation. In 1634, two priests of the order of Minims, wrote a small book on mathematical and physical, as well as theological and moral questions, in which a description of a submarine boat is given. One of these priests, Father Mersenne, was the first to propose a metallic hull for submarine craft. He likewise pointed out that all vessels of this nature should be pisciform. The two extremities, he thought, ought to be spindle-shaped, so that progress might be equally easy in either direction. In 1640, a Frenchman named Jean Barrie, obtained a patent from Louis XIII., by which his majesty granted him the privilege for twelve years of taking from the bottom of the sea by means of a vessel moving under water any merchandise that might be found there. Mr. Burgoyne thinks that this vessel was nothing but a diving bell. In 1654, a French engineer, named De Son, constructed a submarine boat at Rotterdam. This vessel resembled that of Van Drebel in many respects, but was larger, and was propelled by a paddle-wheel instead of oars. The length was 72 ft., the beam 8 ft., and the depth 12 ft. In 1685 Louis XIV. received a communication setting forth the invention of a Neapolitan Jesuit, Ciminius by name. The invention professed to provide the means for men and ships to rise or sink at will, and to remain with freedom of action at the bottom of the sea for at least seven hours, if not for a whole day. Three years later one Roger Doligny, proposed to the same king a machine by which one might go beneath the surface of the sea, and sink to the bottom. The inventor maintained that, with such a vessel, one might destroy all the armaments of one's enemies and enter or leave at will any hostile port, destroying therein all shipping, merchandise or obstructions, and, if necessary, aiding a landing party.

In the records of the English patent office there is, under the date of 1691, a reference to one John Holland who patented an engine for submarine navigation. It is a curious coincidence that the vessel of a present-day John Holland should be accepted by the British admiralty as the most advanced type of submarine. In the same year (1691) a Sir Stephen Evance patented a submarine boat. In 1715 John Lethbridge built a submarine boat which he described as the first diving machine not communicating with the outer air. His primary experiments were made with a disused sugar barrel, in which he at one time managed to remain submerged for over half an hour. He subsequently had a vessel of copper made, 6 ft. long by 2 ft. 6 in. in diameter at its widest, which was at the top, the apparatus being cone-shaped. The diameter at the bottom was only 1 ft. 6 in. It was entered from the top, and the cover could be hermetically sealed; 500 lbs. of ballast were taken on board, and the machine then sank; if the occupant desired to reascend, he had but to detach 15 lbs. thereof. Vision was obtained through a 4-in. window, fitted with 1½-in. glass, while, as in many other later vessels, two jointed arms were fixed in the sides, by means of which objects on the ground might be collected and brought to the surface. In 1733, an apparatus of this kind was used in the harbor of Marseilles to endeavor to obtain some specie from a vessel that had sunk there. Thirteen years previously a like machine had been made use of in futile attempts to secure part of the gold supposed to have been sunk with the Spanish galleons in Vigo bay during an action between the British and combined French and Spanish fleets. A considerable interval elapsed before another experiment in submarine navigation was made. In the Gentleman's Magazine (1747), an article was published on a submarine boat constructed by a man called Symons, which had been tested on the Thames. It took the form of a galley, with a domeshaped roof, and was immersed through the augmentation of weight produced by filling leather bottles. Propulsion was obtained by the aid of four pairs of oars, which were worked in joints of greased leather. The boat was made of wood, and rendered watertight in the same way as was Van Drebel's.

METALLIC-HULLED SUBMARINE BOATS.

With Bushnell's Turtle begins, in 1773, the long list of metallic-hulled submarine boats. David Bushnell, to whom belongs the honor of having invented the first submarine craft which really navigated under serious conditions, and gave incontestably valuable results, was an American engineer. His little boat, which took four years to make, had the form of a turtle, and was named after that chelonian. The shape, though not, of course, conducive to great speed, favored stability. The Turtle could only hold one man, with a sufficient supply of air for half an hour's submersion. At the lower extremity of the hull was placed the safety-weight, a mass of lead, which also acted as ballast. The mode of propulsion employed has been the subject of some dispute, apparently because Bushnell is credited with providing two methods. According to one design, which is probably authentic, propulsion was obtained by oars fixed in the sides of the boat by watertight joints. Steering was affected by a rudder, or, rather, paddle, at the back, the operator sitting on a seat. The conning tower was just large enough for the head of the occupant, and was fitted with lookout windows. In this design the Turtle is equipped with a bomb, or detachable charge of powder, with which it was intended to blow in the bottom of an enemy's ship. The fact is recalled that in 1776 David Bushnell obtained the permission of Gen. Parsons to make use of his submarine against the English fleet, then anchored to the north of Staten island. He instructed Sergt. Ezra Lee in the working of his little craft. After several trial trips the sergeant tried one calm night to attack one of the blockading ships, a 64-gun frigate. He was towed as close to the ship as possible by two rowboats, and he maneuvered so as to sink just under his enemy. He could not fix his torpedo, however, as the English ship was sheathed with copper, and his boat did not offer enough resistance for him to pierce a hole in the enemy's vessel. Carried along by the current, the sergeant soon lost sight of his adversary, while the torpedo floated about on the surface of the water, blowing up an hour later with a terrific explosion, to the great terror of the English, to whom this kind of warfare was unknown.

DE VALMER PROJECTED THE CIGAR-SHAPED SUBMARINE.

In 1780, seven years after Bushnell's first experiments, a Frenchman, by name Sillon de Valmer, sent a proposal for a submarine boat to the minister of the marine, in which he offered to construct a vessel which could not only navigate with perfect ease the surface of the sea, but could also sink below the surface and move about. The vessel was to be barrel-shaped, terminated at each end by a pointed cone. Our author holds, therefore, that to De Valmer belongs the honor of having first suggested the shape now so general in all submarines. In the bows of his vessels was to be placed a small conning tower which would communicate with the interior. The dimensions of this tower were to be, diameter 3 to 4 ft. and height 7 ft., whilst the boat on which it was to be supported would have a length of 54 ft., a beam of 16 ft. and a depth of 12 ft. 6 in., the whole having a displacement of 8,000 cu. ft. Propulsion was to be obtained by means of oars placed on each side, and having the palettes hinged on each side of the stock in such a manner that they would close up when the oar was pushed forward at the end of each stroke. This method of propulsion has been reproduced in later vessels, notably in the Goubet II. Although purely theoretical, Mr. Burgoyne considers De Valmer's proposals well worthy of notice, as being sound and practicable. His ideas, like those of many other inventors, were many, many years in advance of the mechanical resources of the day. A little later another French inventor, one Beaugenet, offered to build a submarine boat with which one might go into the center of London without a single Englishman being a whit the wiser. This boat, which required only five or six men as a crew, was to be armed with cannon. In March, 1795, M. Armand-Maiziere, placed before the committee

of public safety the plans of a steam submarine vessel, which was to be worked by a number of oars vibrating on the principle of a bird's wings. While these oars were destined to aid the boat in her forward progress, others were placed so as to aid in submerging it. According to a description of the proposed submarine the steam engine was made up of a cylinder in which was to be placed a piston actuated by the vapor of water generated in a strongly-bound wooden boiler. The water was to be heated by a stove. By means of couplings the movements of the piston were to be transmitted to one or more rows of oars. Nearly a century was to pass away before inventors would again supply their submarines with separate motors to aid in submerging them. In 1796 Jules Babre, a professor of chemistry and mathematics in the University of Aix, laid before the minister of the marine a treatise on submarine navigation and the use that might be made of it to ruin the English navy.

FULTON INVENTED A SUBMARINE ALSO.

The well known American engineer, Robert Fulton, was not only one of the inventors of the steamship, but was also greatly attracted by the possibilities of submarine navigation. He submitted his plans to the French government in 1797, and a commission appointed to examine them made a favorable report. The minister of marine, however, was inflexibly opposed to the innovation. Fulton then made a model of his submarine, which again was received with favor by the commission chosen to report upon it. Nevertheless, Fulton's proposal was again rejected, and the same ill luck awaited him at the hands of the Dutch government. Undiscouraged by these rebuffs, he applied in 1800 to Bonaparte, then first consul, who, after due consideration, appointed three eminent men, Laplace, Monge and Volney, to examine Fulton's plans, and also gave the inventor 10,000 francs to carry out experiments. By May, 1801, Fulton had completed a submarine boat, which he called the Nautilus. A first trial took place in the Seine, opposite the Invalides. We should note that the Nautilus was a cigar-shaped boat, about 21 ft. 7 in. long and 7 ft. in diameter. The hull, as in the case of the Turtle, was of copper, but supported by iron ribs. A novel feature was a collapsible mast and sail, for use on the surface, which, when submerged, folded compactly and fitted into the deck. At the forward end of the boat projected a small conning tower, in which the occupant kept watch and steered. The steering was affected by a rudder and the propulsion, when the boat was submerged, by a wheel fixed to the center of the elliptically shaped stern. This wheel was rotated by a hand-winch. A small anchor was suspended from the bows, and a keel for aiding the stability of the vessel, ran the whole length of the hull. On the first trial of the Nautilus, Fulton and one sailor formed the crew, and with nothing but a candle to light the interior they remained submerged twenty minutes. On coming to the surface they found that the current had carried them a considerable distance down the river; so, again sinking beneath the surface, Fulton steered his vessel to the point of departure. Having made some alterations in his boat, among them being the insertion into the hull of a sheet of plateglass for the purpose of getting a little light from without, the inventor, accompanied by three other persons, descended on June 3, 1801, at Brest, whither the submarine had been conveyed. Having arrived at a depth of 25 ft., he accomplished various evolutions, remaining submerged for over an hour.

On June 26 he sailed out of the harbor and then suddenly lowered his mast and disappeared from view, giving a proof of the dispatch with which the feat could be accomplished. On the same day he succeeded in blowing up an old hulk, placed at his disposal by the French government. On Aug. 7, having introduced air at high pressure into the Nautilus, Fulton stayed under water five hours without suffering the slightest inconvenience. Just as his efforts, however, were crowned with all the success he had hoped for, the French authorities ceased to take much interest in his project, and declined to adopt it.

A SUBMARINE ON THE GREAT LAKES.

Mr. Burgoyne then follows chronologically some English and German inventions and adds that in 1851 an American shoemaker, Lodner D. Phillips, constructed two submarine boats. They were each 40 ft. in length, but the first had a diameter of 5 ft., and carried a spar torpedo, while the second was only 4 ft. in diameter. They both were shaped like a very pointed cigar. Submersion was obtained by the filling of tanks running fore and aft. Phillips died on board one of his vessels on Lake Erie, crushed to death by sinking to a depth too great for his boat to support the pressure of water. During the same year a Frenchman named Alexandre made some futile attempts in New York harbor to solve the problem of submarine navigation. Bigard, another inventor who interested himself in the subject, was equally unsuccessful. Useless, also, was the machine produced by Le Batteaux in 1852; it resembled a huge barrel bound with thick iron rings, and was intended to descend to great depths for the purpose of examining the hulks of sunken vessels.

Efforts to perfect a submarine or submersible since the Civil war occupy a great deal of Mr. Burgoyne's attention. He appears to think that the submarine will eventually have utility even if it has it not now. He believes in the multiplication of submarines especially for less defensive nations. He thinks that if Russia had 162 submarines and forty-two submersibles she would be practically free from sea attack of her coast cities. Russia could have this number for the money that she is now spending on battleships.

SEEN AND HEARD ON THE LOOKOUT.

It appears that the Netherland government has at last succeeded in ending their war with the Atchinese, and this being the case the Dutch can now devote all their time to the taking of Holland. Atchin is the northeastern part of the island of Sumatra, and the Dutchman's experience in this land of flowers without scent, birds without song, and white men without health proved that every dusky warrior, when captured, was a faithful believer in benevolent assimilation, though the soldiers who had met them in their "kampongs" might not accept this statement unqualifiedly.

The kingdom of the Netherlands contains about 5,000,000 inhabitants, and as about 35,000,000 of benevolently to be assimilated human beings exist on Sumatra the long duration of the so-called Atchinese war can hardly surprise anyone. During all these years that the unpleasantness lasted the Dutch government kept war vessels around the island to prevent the exportation of pepper, and the importation of arms. A man of war was anchored off Oleh-leh when a rumor reached the officers that a bark had been seen 40 miles to the northward. After dark and unperceived by the runners ashore, who otherwise might have communicated the intelligence to their friends, the warship got under way without showing any lights and anchored 40 miles further up the coast. Boats were lowered, manned, and sent on a hunt for smugglers.

On this occasion I was gracefully permitted to be in at the death. It was about 7 o'clock in the morning when the boats returned with a prize—a 30-ft. Atchinese "proa"—the bamboo so abundantly used in her construction creaking loudly, and suggestive of the advent of an army of overloaded baby-buggies. The Atchinese craft was ordered tied astern until the warship's commander could pass upon the case.

To those of your readers who are not versed in warship etiquette it may be necessary to explain that though the commander was on deck while the "proa" passed astern he only contemplated her as a Dutch gentleman, and not until an hour later, when eight bells were struck, the Dutch flag sent to the peak of the gaff, and being saluted by the first officer who told him that a prize had been secured was he allowed to know in his official capacity of the night's luck.

What fools these mortals be!

The commander was a good actor and his expression of wonder upon being informed that the bamboo monstrosity bobbed astern reminded me of the following episode in a theater: "The hero walked across the stage supposedly unaware of being pursued by a large knife carrying villain, and this so excited a nervous individual in the gallery that he could not refrain from loudly warning the menaced one. This rather spoiled the second act when the pursued is expected to be astonished upon being told of the close shave he had."

A mixture of etiquette and discipline prevented the spoiling of the comedy enacted on the warship's quarterdeck, and though commander and first officer had discussed the night's happening at the breakfast table, when eight bells were struck the captain's question "a prize you said, sir " sounded innocent and natural.

Contents of prize: "One bag of pepper; one Chinaman, the white silken tassel depending from whose "queue" declaring him to be in mourning—and well he might; two Atchinese of the male persuasion, and one dusky member of the decorative sex, the sawed-off condition of whose upper teeth proclaimed her a native of the island of "madura," and incidentally as having a peculiar notion as to what constitutes decoration; three "kilewangs"—native swords—and the searching for which among the bamboo mats disturbed an army of cockroaches. In conclusion I regret to have to state that warship etiquette did not permit the officers to inform me as to the manner in which the authorities would dispose of their catch, and I only catalogued the contents of the "proa" so that none may wonder at the length of time it took to subdue the Atchinese, taking into consideration the number there are ashore and the few occasionally caught at sea.

Excepting possibly in the immediate environs of the north and south poles it is no longer probable that we shall ever hear again of anyone who found himself in Robinson Crusoe's predicament, and it is not likely even should some unlucky traveler become a cast-away upon a desolate island that the time of his enforced stay would be lengthy.

It may interest your readers to hear the story of some sailors who, a couple of years ago, involuntarily imitated Mr. Crusoe.

A German schooner with crew of six hands all told, loaded with sugar consigned to a firm in Porto-Allegro, Brazil, anchored off Rio Grande Do Sul to await the arrival of a lake pilot. Porto-Allegro is a Brazilian city of some consequence in that part of the world, and reached from the ocean by sailing across a large island dotted fresh water lake named "Lagoa dos Patos."

It was on the second night after leaving Rio Grande, and having on account of light breezes only traversed one-third of the lake's length, that the schooner in question was caught in a "pampero," a violent wind that derives its name from blowing across the southwestern "pampas."

To shorten the story of this fresh water trip may it suffice to say that through a mistake made by the Rio Grande hired pilot the vessel ran aground on the so-called "Banco do Barbe Negro," and became a total wreck. Notwithstanding the rapidly increasing sea, the strong gale, and the drenching rain the sailors managed to make two trips in their only boat from the wreck to a nearby island with, as later proved to be the case, much needed provisions. A third attempt to reach what remained of the schooner failed on account of the boat being stove in on a rock, though without causing loss of life.

A telegram having apprised the German consul in Porto-Allegro of the schooner's departure from Rio Grande, said official at last sent out a relief expedition which resulted in the restoration to civilization of this ship-wrecked crew after a Robinson Crusoesque experience for two weeks. The immense wooden tiller, the incapable handling of which caused the schooner's wreck, may yet be seen on Porto-Allegro's pier, while one of the sailors, and the man who told this, is now engaged in the profitable work of brewing German lager beer for grateful Brazilians.

Of late we have, of course, all been more or less interested in yachts, and in the backwoods as well as on mountain tops the trips of pleasure craft in general, but the performance of Reliance and Shamrock in particular, have been read and discussed. Sunday papers gave detailed explanations of nautical terms, and in some of them were descriptions, not to forget the pictures, of young society ladies "who sailed their own boats." Only pessimistic philosophers agree with Schopenhauer that "by managing to appear attractive woman has fulfilled every duty in life," but the statement that some of the feminine "jeunesse doree" sailed their boats may be termed circulating polite fiction.

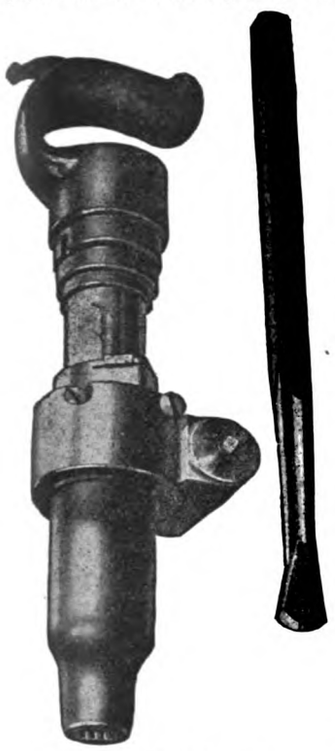
In his element, skimming over the top of the waves, the albatross would lift any cups that might be offered as a reward for the embodiment of grace, while this same bird, out of his element, as, for instance, when transferred to a ship's deck, not only gets seasick but immediately becomes the most clumsy being imaginable. It is proverbially dangerous to assert a negative so that instead of declaring my unalterable disbelief in the possibility of young ladies sailing their yachts I shall simply give it as my opinion—and said opinion was formed upon noting the similarity of transformation taking place in a young lady and an albatross when either was transferred from their respective elements to a to them so uncongenial a place as a wobbly ship's deck—that it sounds improbable. F. H.

The statistics on shipping in the harbor of Valparaiso for the past year note the arrival of 8,000 vessels of all classes and the departure of practically the same number, with a tonnage, both incoming and outgoing, of something like 12,000,000 tons. Notwithstanding the great shipping interests represented by these figures and the further fact that Valparaiso is the chief commercial port of Chile—the second city in size in the Republic, with a population of 150,000 inhabitants—the harbor, or rather the bay upon which the city is built, is one of the most insecure on the west coast of South America. There is absolutely no protection to ships and shipping interests against the strong winds and severe storms that prevail during the months of June, July, and August of each year. There is no breakwater in the bay of Valparaiso, which fronts to the north, the direction from which the severe storms and heavy seas come during the winter months. As a result, great damage is done to vessels in port and to cargoes along the water front by the storms called "northers." Not infrequently ships and many lives are lost. The insecurity of the harbor is such that most of the steamships put to sea upon the approach of a norther in order to avoid possible disaster. Sailing vessels, of which there are always a large number in port, are unable to quit the harbor in time of storms; consequently, many are damaged or are driven ashore and destroyed.

During July Scotch ship builders launched seventeen vessels, of about 17,315 tons gross, as compared with twenty-nine vessels, 29,885 tons gross, in June, and nineteen vessels, of 32,022 tons gross, in July last year. In the seven months Scotch builders have launched 156 vessels, aggregating 292,326 tons gross, as compared with 176 vessels, of 331,768 tons gross, in the corresponding period of last year.

THE CHICAGO PLUG DRILL.

The Chicago plug drill, made by the Chicago Pneumatic Tool Co., consists of an arrangement whereby the regular No. 1 Boyer hammer is equipped with a drill and a rotating device, which automatically turns the drill while the hammer is delivering the blows. It has been used with exceedingly gratifying results in a large number of the quarries and cutting sheds throughout the country and has demonstrated very conclusively that it is a decided success. In construction it is very simple, requiring very little repairing, and as all the parts are readily accessible, it can, of course, be very easily cleaned. The drill weighs 18 lbs. complete, consumes 20 cu. ft. of free air per minute at 80 lbs. pressure and will drill a hole 5/8 in. in diameter by 3 in. deep in any kind of stone. In one instance a hole of this size, 3 in. by 5/8 in., was drilled in 20 seconds in moderately hard stone, which is considered a very remarkable record.



Chicago Plug Drill.

One very advantageous feature about this machine is that it will drill in all classes of stone with equal rapidity, simply requiring in the case of the harder stone a different dressing of the drill blanks. The drills which are used in them do not require re-sharpening nearly as frequently as in hand drills on account of the light, rapid blow which they strike. In some instances as high as twenty holes have been drilled without re-sharpening the drill. In all classes of plug and feather work these drills have been found invaluable, and it is a very practical machine for either top or side line work, its weight being so slight that but one hand is required to operate it. The company says that results thus far have conclusively proved that it is without doubt the most satisfactory rock drill on the market today.

LAKE SUBMARINE BOAT PROTECTOR.

Upon the invitation of the inventor, Simon Lake, a party of newspaper men inspected the latest specimen of the Lake submarine boat, the Protector, at Bridgeport, last week. The Lake type of boat differs from that with which the public is already familiar in several respects. It has an air-tight compartment out forward, from which a trap door opens into the water below. By that means a submarine diver could cut a telegraph cable, sever the connection between shore batteries and mines in a harbor, and perform other feats that would be serviceable in war. Several guests went into this air chamber to watch a diver make his exit and return. An alteration of the original design of the Lake submarine gives it three launching tubes for Whitehead torpedoes. One of these missiles, not loaded for service, was ejected for purpose of illustration. Lieut. John Halligan, of the United States navy, has been assigned to duty temporarily on the Protector, and is in charge of torpedo operations. Both he and R. C. Skerrett, formerly in the naval service, assisted Mr. Lake in explaining the many interesting features of the boat. One of the most important of these is the omniscope, wherewith the officer in command is able to obtain a view of the enemy and get his bearings. The device rises from the conning tower, and has a more complete sweep of the horizon than other optical apparatus performing the same function. Still another novelty is the provision made for supplementing the usual agencies that depress and raise the boat in the sea. Besides employing water storage and pumps and a horizontal rudder, Mr. Lake has two long, narrow sheets of metal on each side of, and exterior to, the hull. These hydroplanes normally remain exactly horizontal. By lifting or lowering their forward ends slightly when they are submerged he alters the level of the boat itself.

INJURIES TO THE MASSACHUSETTS.

Real Admiral Rodgers, commandant of the New York navy yard, has reported as follows regarding the injuries to the battleship Massachusetts:

"Careful examination of the Massachusetts in dock shows injuries to docking keels and bottom plating, substantially as reported from Bar harbor. Considering character and extent of injuries, temporary repairs inadvisable. Injuries can be thoroughly and permanently repaired in seventy working days at estimated cost of labor, $36,000; material, $6,000."

Admiral Rodgers also recommended that the Massachusetts be kept in No. 3 dock, and that the repairs to her bottom be immediately undertaken. The other vessels of the squadron ordered to New York for repairs should, in his opinion, be docked in No. 2 dock, except the Indiana, which is too large. The bureau of construction and repairs recommended to the secretary of the navy that permanent repairs be made on the Massachusetts at the cost estimated, and Acting Secretary Darling approved the recommendation.

The distribution of the ships of the North Atlantic station for repairs at navy yards, preparatory to the winter maneuvers, has been made by Acting Secretary of the Navy Darling. The Nashville, Arethusa, Scorpion, Newport and Hist have been assigned to the yard at Boston. The New York navy yard will have the Indiana, Illinois, Massachusetts, Kearsarge, Alabama, Texas, Chicago, Dolphin and Baltimore. The Norfolk yard will get the Olympia, Caesar, Lebanon, Marcellus, Leonidas, Chauncey, Worden, Barry, Bainbridge, Decatur, Dale, Whipple, Truxton, Stewart and Lawrence. The Yankee, Hartford, Panther and Prairie will go to the League Island navy yard; the Vixen, Potomac, Essex and Monongahela to Portsmouth; and the Bancroft and Wasp to Pensacola. The work to be done on most of these vessels is of a minor character. On the Massachusetts, Chicago, Barry and Decatur, however, the work will amount to a thorough overhauling.

It is announced that the Commercial Pacific cables, operated in connection with the land lines of the Postal Telegraph Co., are now open for business to and from the Philippines, Ladrone islands, China, Japan and Corea. The rate per word between points named and San Francisco will be as follows: Midway, 60 cents; Guam, 85 cents; Manila and Luzon islands, $1.05; all other Philippine islands, $1.50; Hong Kong, $1.10; China, $1.10; Macao, $1.15; Japan, $1.41; Chemulpo, Fuzan and Seoul, in Corea, $1.41; other places in Corea, $1.49; Formosa, $1.41.

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U. S. Engineer Office, Witherspoon Building, Philadelphia, Pa., Aug. 21, 1903. Sealed proposals for constructing wooden, single screw, suction dredge for Key West Harbor, Fla., will be received here until 12, noon, Sept. 21, 1903, and then publicly opened. Information furnished on application. J. C SANFORD, Capt., Engrs. Sept. 17

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BUCKETS, ORE AND COAL.

Bartlett & Snow Co., C. O. .....Cleveland.
Brown Hoisting & Conveying Machine Co. Cleveland.
Wellman-Seaver-Morgan Co. .....Cleveland.

CABIN AND CABINET FINISHING WOODS.

Martin-Barriss Co. .....Cleveland.

CAPSTANS.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co. .....Bath, Me.

CEMENT, IRON FOR REPAIRING LEAKS.

Smooth-On Mfg. Co. .....Jersey City, N. J.

CHAINS.

Standard Chain Co. .....Pittsburg.

CHAIN HOISTS.

Boston & Lockport Block Co. .....Boston, Mass.
Dake Engine Co. .....Grand Haven, Mich.

CHARTS.

Marine Review Pub. Co. .....Cleveland.
Potter, J. D.....London.

CIRCULATOR, EQUILIBRIUM.

With Steam Heating Attachment.

Bloomsburg & Co., H. .....Baltimore, Md.

CLOCKS (Maine), CHRONOMETERS, BELLS.

Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Chelsea Clock Co.....Boston.
Ritchie, E. S. & Sons.....Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.

Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburg Coal & Iron Co.....Buffalo.

COAL AND ORE HANDLING MACHINERY.

Bartlett & Snow Co., C. O. .....Cleveland.
Brown Hoisting Machinery Co., (Inc.)....Cleveland.
Lidgerwood Mfg. Co.....New York.
Wellman-Seaver-Morgan Co.....Cleveland.

COMPASSES.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass

COMPASS ADJUSTER.

Smith, Capt. W. J.. .....Seattle, Wash.

CONDENSERS.

Thropp & Sons Co., John E.... .....Trenton, N. J.

CONTRACTORS FOR PUBLIC WORKS.

Buffalo Dredging Co.....Buffalo.
Chicago & Gt. Lakes Dredge & Dock Co...Chicago.
Lake Erie Dredging Co.....Buffalo.
Smith Co., L. P. & J. A. .....Cleveland.

COPPER, TIN AND SHEET IRON WORK.

McCutcheon, C. H.....Buffalo.
Rippley Hardware Co..... Grafton, Ill.

COPPER—SHEET, TUBES AND ROD.

Waterbury Brass Co.....New York.

CORDAGE

Baker & Co., H. H.....Buffalo.
DeGrauw, Aymar & Co.....New York.
Upson-Walton Co.....Cleveland.

CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburg Pa.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot .....Long Island City, N. Y.

CHAIN CONVEYORS, HOISTS.

Bartlett & Snow Co., C. O. .....Cleveland.
Brown Hoisting Machinery Co., (Inc.)....Cleveland.
Chicago Pneumatic Tool Co.....Chicago.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mfg. Co.....New York.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

DEAD-LIGHTS, AIR-PORTS, ETC.

"Long-Arm" System Co. .....Cleveland.

DISTANCE FINDER.

Nicholson Ship Log Co..... .....Cleveland, O.

DIVING APPARATUS.

Morse, A. J. & Son.....Boston.
Schrader's Son, A.....New York.

DOORS, WATER TIGHT, ETC.

"Long-Arm" System Co. .....Cleveland.

DRAWING MATERIALS.

Schwencke, Kirk & Co.....New York.

DREDGE ENGINES FOR HANDLING DUMP SCOW LINES.

Superior Iron Works.....West Superior, Wis.

DREDGING CONTRACTORS.

Buffalo Dredging Co.....Buffalo.
Chicago & Gt. Lakes Dredge & Dock Co...Chicago.
Lake Erie Dredging Co.....Buffalo.
Smith Co., L. P. & J. A. .....Cleveland.

DRILLS

Chicago Pneumatic Tool Co... ..... Chicago.

DRYING APPARATUS.

Sturtevant, B. F. Co.....Boston.

DRY DOCKS.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Crescent Ship Yard Co.....Elizabethport, N. J.
Detroit Ship Building Co.....Detroit.
Great Lakes Engineering Works .....Detroit.
Lockwood Mfg. Co.....East Boston, Mass.
Manitowoc Dry Dock Co.....Manitowoc, Wis.
Marine Construction & Dry Dock Co.....New York.
Maryland Steel Co.....Sparrow's Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.
Moran Bros. Co.....Seattle, Wash.
Newport News Ship Building Co Newport News, Va.
Shipowners Dry Dock Co.....Chicago.
Superior Ship Building Co.....Superior, Wis.
United States Ship Building Co.....New York.

ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mfg. Co.....New York.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

ELECTRIC LIGHT AND POWER PLANTS.

Electro-Dynamic Co.....Philadelphia.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Sturtevant, B. F. Co.....Boston.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

ELECTRIC STEERING GEAR, SPEED AND RUDDER INDICATORS, ETC.

Electro-Dynamic Co.....Philadelphia.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Forge Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Crescent Ship Yard Co.....Elizabethport, N. J.
Dake Engine Co. .....Grand Haven, Mich.
Detroit Ship Building Co.....Detroit.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

ENGINE BUILDERS, MARINE.—Continued.

Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Ship & Engine Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit, Mich.
Hall Bros. .....Philadelphia.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mfg. Co.....East Boston, Mass.
Macbeth Iron Co.....Cleveland.
Maryland Steel Co.....Sparrow's Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.
Moran Bros. Co.....Seattle, Wash.
Mosher, Chas. D.....New York.
Neafie & Levy Ship & Engine Building Co....Phila.
Newport News Ship Building Co Newport News, Va.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mfg. Co.....Milwaukee.
Superior Ship Building Co.....Superior, Wis.
Thropp, J. E. & Sons Co.....Trenton, N. J.
Trout, H. G. .....Buffalo.
United States Ship Building Co.....New York.
Warrington Iron Works.....Chicago.
Willard, Chas. P. & Co.....Chicago.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.
Electro-Dynamic Co.....Philadelphia.
MacLean Hydraulic Signal Co.....Chicago.

ENGINEERING SPECIALTIES AND SUPPLIES.

Crane Co. .....Chicago.
Farnan Brass Works.....Cleveland.
Kieley & Mueller.....New York.
Lunkenheimer Co.....Cincinnati.
McCutcheon, C. H. .....Buffalo.
New York Belting & Packing Co.....New York.
Reilly Repair & Supply Co., James....New York.
Rippley Hardware Co ..... Grafton, Ill.

ENGINEERS, MARINE, MECHANICAL, CONSULTING.

Electro-Dynamic Co.....Philadelphia.
Garrett-Cromwell Engineering Co.....Cleveland.
Gaskin, Edward .....Buffalo.
Hunt, Robt. W. & Co.....Chicago.
Kidd, Joseph .....Duluth, Minn.
Logan, Robert .....Cleveland.
Matteson & Drake.....Philadelphia.
Mosher, Chas. D.....New York.
Newman, R. L. .....New York.
Pittsburg Testing Laboratory, Ltd.....Pittsburg.
Powell, Ambrose V.....Chicago.
Roelker, H. B. .....New York.
Sadler, Perkins & Field .....New York.
Wood, W. J. .....Chicago.

EVAPORATING AND DISTILLING APPARATUS.

Reilly Repair & Supply Co., James....New York.

FANS FOR VENTILATION, EXHAUST, ETC.

Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Reilly Repair & Supply Co., James....New York.
Ross Valve Co.....Troy, N. Y.

FIXTURES FOR LAMPS, OIL OR ELECTRIC.

General Electric Co.....Schenectady, N. Y.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

FORGES.

Sturtevant, B. F. Co.....Boston.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.

Cleveland City Forge & Iron Co.....Cleveland.
Fore River Ship & Engine Co.....Quincy, Mass.
Macbeth Iron Co.....Cleveland.

FLUE WELDING.

Fix's, S. Sons .....Cleveland.

FURNACES FOR BOILERS.

Continental Iron Works.....New York

FUELING COMPANIES AND COAL DEALERS.

Hanna, M. A. & Co.....Cleveland.
Ironville Dock & Coal Co.....Toledo, O.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburg Coal & Iron Co.....Buffalo.
Smith, Stanley B. & Co.....Detroit.
Smith Coal & Dock Co., Stanley B.....Toledo, O.
Youghiogheny & Lehigh Valley Coal Co....Chicago.

GASKETS, RUBBER.

New York Belting & Packing Co.....New York.

GAS BUOYS.

Safety Car Heating & Lighting Co.....New York

GAS AND GASOLINE ENGINES.

Chase Machine Co.....Cleveland.

GAUGES, STEAM AND VACUUM.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Lunkenheimer Co.....Cincinnati.

GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.
United States Graphite Co.....Saginaw, Mich.

HAMMERS, PNEUMATIC.

Chicago Pneumatic Tool Co..... Chicago.

HAMMERS, STEAM.

Chase Machine Co.....Cleveland.

HATCH GEARS.

"Long-Arm" System Co. .....Cleveland.

HEATING APPARATUS.

Sturtevant, B. F. Co.....Boston.

HOISTS FOR CARGO, ETC.

American Ship Building Co.....Cleveland.
Brown Hoisting Machinery Co., (Inc.)....Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co. .....New York.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mfg. Co.....New York.
Marine Iron Co.....Bay City.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

HOLLOW STAYBOLT IRON.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

HOSE FITTINGS.

Farnan Brass Works.....Cleveland.

HOSE, RUBBER.

New York Belting & Packing Co.....New York.

HYDRAULIC DREDGES.

Great Lakes Engineering Works..... Detroit.

HYDRAULIC TOOLS.

Watson-Stillman Co., The.....New York.

ICE MACHINERY.

American Linde Refrigerating Co.....New York.
Roelker, H. B. .....New York.

INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.

INJECTORS.

American Injector Co.....Detroit.
Crane Co.....Chicago.
Jenkins Bros. .....New York.
Lunkenheimer Co.....Cincinnati.
Penberthy Injector Co. .....Detroit, Mich.

INSURANCE, MARINE.

Brown & Co. .....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Fleming & Co., P. H. .....Chicago.
Hawgood & Co., W. A. .....Cleveland.
Helm & Co., D. T. .....Duluth.
Hutchinson & Co. .....Cleveland.
McCarthy, T. R. .....Montreal.
McCurdy, Geo. L. .....Chicago.
Mitchell & Co. .....Cleveland.
Peck, Chas. E. & W. F. ..New York and Chicago.
Richardson, W. C. .....Cleveland.
Sullivan, D. & Co.....Chicago.
Weeks, F. H. .....New York.

IRON ORE AND PIG IRON.

Bourne-Fuller Co. .....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.

Marine Construction & D. D. Co.....
.....Mariner's Harbor, S. I., N. Y.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
Warrington Iron Works.....Chicago.
Willard, Chas. P. .....Chicago.

LIFE FLOATS.

Carley Life Float Co. .....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS.

Armstrong Cork Co. .....Pittsburg.
Carley Life Float Co.....New York.
Dreln, Thos. & Son .....Wilmington, Del.
Kahnweiler's Sons, D. .....New York.
Lane & DeGroot .....Long Island City, N. Y.
Marine Construction & Dry Dock Co.....
.....Mariner's Harbor, S. I., N. Y.
Rippley Hardware Co ..... Grafton, Ill.

LIGHTS, SIDE AND SIGNAL.

Helvig, H. A. J. .....New York.
Russell & Watson .....Buffalo.

LOGS.

Bliss, John & Co.....New York.
Negus, T. S. & J. D. .....New York.
Nicholson Ship Log Co. .....Cleveland.
Walker & Sons, Thomas .....Birmingham, Eng.
Also Ship Chandlers.

LUBRICATING GRAPHITE.

Dixon Crucible Co., Joseph..... Jersey City, N. J.
United States Graphite Co .....Saginaw, Mich.

LUMBER.

Martin-Barriss Co. .....Cleveland.
Moran Bros. Co.....Seattle, Wash.
Shurick, F. S. .....New York.

MACHINISTS.

Chase Machine Co.....Cleveland.
Lockwood Mfg. Co .....East Boston, Mass.
Macbeth Iron Co.....Cleveland.
Union Machine & Boiler Co. .....Cleveland.

MACHINE TOOLS (WOOD WORKING).

Atlantic Works, Inc. .....Philadelphia.

MAN-HOLES, SWING DOORS, ETC.

"Long-Arm" System Co. .....Cleveland.

MARINE RAILWAYS, BUILDERS OF

Crandall & Son, H. I. .....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W. .....New York.

MECHANICAL DRAFT FOR BOILERS.

American Ship Building Co.....Cleveland.
Bloomsburg & Co., H. .....Baltimore, Md.
Detroit Ship Building Co.....Detroit.
Sturtevant, B. F. Co.....Boston.

METALLIC PACKING.

Hayden Mfg. Co., N. L. .....Columbus, O.
Katzenstein, L. & Co. .....New York.
U. S. Metallic Packing Co. .....Philadelphia.

METAL POLISH.

Bertram's Oil Polish Co.....Boston.

MOTORS, GENERATORS—ELECTRIC.

Electro-Dynamic Co.....Philadelphia.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
"Long-Arm" System Co. .....Cleveland.
Sturtevant, B. F. Co.....Boston
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

NAUTICAL INSTRUMENTS.

Bliss, John & Co. .....New York.
Negus, T. S. & J. D. .....New York
Ritchie, E. S. & Sons .....Brookline, Mass.

NAUTICAL SCHOOLS.

Chicago Nautical School. ..... Chicago.
Seattle Nautical School .....Seattle, Wash.

NAVAL ARCHITECTS.

Gaskin, Edward .....Buffalo.
Kidd, Joseph ..... Duluth, Minn.
Logan, Robert .....Cleveland.
Matteson & Drake.....Philadelphia.
Mosher, Chas. D.....New York.
Newman, R. L. .....New York.
Sadler, Perkins & Field .....New York.
Wood, W. J. .....Chicago.

OAKUM.

DeGrauw, Aymar & Co. .....New York.
Stratford Oakum Co. .....Jersey City, N. J.

OIL FOR PAINTING.

Sipe & Co., James B.....Allegheny, Pa.

OILS AND LUBRICANTS.

Dixon Crucible Co., Joseph .....Jersey City, N. J.
Standard Oil Co. .....Cleveland.
United States Graphite Co ..... Saginaw, Mich.

PACKING.

Crane Co. .....Chicago.
Hayden Mfg. Co., N. L. .....Columbus, O.
Jenkins Bros. .....New York.
Katzenstein, L. & Co. .....New York.
New York Belting & Packing Co. .....New York.
United States Metallic Packing Co...Philadelphia.

PAINTS.

Baker, Howard H. & Co.....Buffalo.
Berry Bros., Ltd. .....Detroit.
Detroit Varnish Co. .....Detroit.
Detroit White Lead Works .....Detroit.
Mohawk Paint & Chemical Co.....Norwich, Conn.
New Jersey Zinc Co. ..... New York.
Sipe & Co., James B.....Allegheny, Pa.
United States Graphite Co.....Saginaw, Mich.
Upson-Walton Co. .....Cleveland.

PATENT ATTORNEYS.

Thurston & Bates .....Cleveland.

PATTERN SHOP MACHINERY.

Atlantic Works, Inc. .....Philadelphia.

PIPE—BRASS AND COPPER, IRON PIPE SIZE.

Waterbury Brass Co. .....New York.

PIPE-JOINT COMPOUND.

United States Graphite Co..... Saginaw, Mich.

PIPE, WROUGHT IRON.

Bourne-Fuller Co. .....Cleveland.
Crane Co. .....Chicago.
Macbeth Iron Co.....Cleveland.

PLANING MILL MACHINERY.

Atlantic Works, Inc. .....Philadelphia.

PLATES—SHIP, STRUCTURAL, ETC.

Bourne-Fuller Co..... Cleveland.

PLUMBING, MARINE.

Reilly Repair & Supply Co., James....New York.
Sands, Alfred B. & Son.....New York.

PNEUMATIC TOOLS.

Allen, John F. .....New York.
Chicago Pneumatic Tool Co. .....Chicago.

POLISH FOR METALS.

Bertram's Oil Polish Co.....Boston.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

POWER DOORS AND HATCHES.
"Long-Arm" System Co.....Cleveland.

PRESSURE REGULATORS.
Kieley & Mueller .....New York.
Ross Valve Co. .....Troy, N. Y.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Crescent Ship Yard Co.....Elizabethport, N. J.
Detroit Ship Building Co.....Detroit.
Fore River Ship & Engine Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Hyde Windlass Co. .....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mfg. Co.....East Boston, Mass.
Macbeth Iron Co.....Cleveland.
Maryland Steel Co.....Sparrow's Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Building Co....Phila.
Newport News Ship Building Co Newport News, Va.
Phosphor Bronze Smelting Co., Ltd. ..Philadelphia.
Risdon Iron Works.....San Francisco.
Roelker, H. B. .....New York.
Sheriffs Mfg. Co. .....Milwaukee.
Superior Shipbuilding Co .....Superior, Wis.
Thropp & Sons Co., J. E. .....Trenton, N. J.
Trout, H. G. .....Buffalo.
United States Ship Building Co.....New York.

PROJECTORS, ELECTRIC.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F., Mfg. Co.....New York.
Great Lakes Engineering Works.....Detroit.
Kingsford Foundry & Machine Wks. Oswego, N. Y.
"Long-Arm" System Co.....Cleveland.

PUNCHES, RIVETERS, SHEARS.
Allen, John F.....New York.
Chicago Pneumatic Tool Co. .....Chicago.

REFRIGERATING APPARATUS.
Roelker, H. B. .....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register .....Cleveland
Record of American & Foreign Shipping.New York.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Automatic Releasing Hook Co. New York.

RIVETING MACHINES.
Allen, John F .....New York.
Chicago Pneumatic Tool Co. .....Chicago.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co. .....Cleveland.

RANGES.
Russell & Watson .....Buffalo.

RIVETS—BRASS AND COPPER.
Waterbury Brass Co. .....New York.

SAFETY VALVES.
American Steam Gauge Co. .....Boston.
Ashton Valve Co. .....Boston.
Crane Co. .....Chicago.
Hayden Mfg. Co., N. L. .....Columbus, O.
Lunkenheimer Co.....Cincinnati.

SAIL MAKERS.
Baker, Howard H. & Co. .....Buffalo.
Upson-Walton Co. .....Cleveland.
Wilson & Silsby .....Boston.

SALVAGE COMPANIES.
See Wrecking Companies.

SCHOOLS, NAUTICAL.
Chicago Nautical School..... Chicago.
Seattle Nautical School..... .....Seattle, Wash.

SEARCH LIGHTS.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

SHEARS.
See Punches, Rivets, and Shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co. .....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Crescent Ship Yard Co.....Elizabethport, N. J.
Detroit Ship Building Co. .....Detroit.
Fore River Ship & Engine Co. .....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mfg. Co.....East Boston, Mass.
Manitowoc Dry Dock Co. .....Manitowoc, Wis.
Marine Construction & Dry Dock Co.....
.....Mariner's Harbor, S. I., N. Y.
Maryland Steel Co.....Sparrow's Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Building Co....Phila.
Newport News Ship Building Co Newport News, Va.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard .....Chester, Pa.
Shipowners Dry Dock Co. .....Chicago.
Smith & Son, Abram .....Algonac, Mich.
United States Ship Building Co.....New York.
Warrington Iron Works.....Chicago.
Willard, Chas. P. & Co.....Chicago.

SHIP CHANDLERS.
Baker, Howard H. & Co. .....Buffalo.
Moran Bros. Co.....Seattle, Wash.
Reilly Repair & Supply Co., James....New York.
Upson-Walton Co. .....Cleveland.

SHIP LANTERNS AND LAMPS.
Helvig, H. A. J. .....New York.
Russell & Watson .....Buffalo.

SHIP TIMBER.
Martin-Barriss Co. .....Cleveland.
Moran Bros. Co.....Seattle, Wash.
Shurick, F. S. ..... New York.

SMOOTH-ON COMPOUND, FOR REPAIRS.
Smooth-On Mfg. Co. .....Jersey City, N. J.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW, OR, SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSELS FOR SALE.
Elwell, Jas. W. & Co. .....New York.
Holmes, Samuel .....New York.
King, Rufus S. .....New York.
McCarthy, T. R. .....Montreal, Can.
Newman, R. L. .....New York.
Weeks, F. H. .....New York.

STEAMSHIP LINES, PASS. AND FREIGHT.
American Line .....New York.
Cleveland & Buffalo Transit Co. .....Cleveland.
Erie & Western Trans. Co. .....Buffalo.
Goodrich Trans. Co. .....Chicago.
International Mercantile Marine Co .. Philadelphia.
Pere Marquette R. R. & S. S. Line.....Milwaukee.
Red Star Line .....New York.

STEEL CASTINGS.
Seaboard Steel Casting Co. .....Chester, Pa.
Macbeth Iron Co.....Cleveland.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Dake Engine Co. .....Grand Haven, Mich.
Detroit Ship Building Co.....Detroit.
Electro-Dynamic Co.....Philadelphia.
Hyde Windlass Co. .....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Sheriffs Mfg. Co. .....Milwaukee.

STOCKS, BONDS, SECURITIES.
Fahey & Co. .....Cleveland.

SUBMARINE DIVING APPARATUS.
Morse & Son, A. J. .....Boston.
Schrader's Son, A. .....New York.

SURVEYORS, MARINE.
Gaskin, Edward .....Buffalo.
Matteson & Drake.... .....Philadelphia.
Newman, R. L. .....New York.
See, Horace .....New York.
Wood, W. J. .....Chicago.

TESTS OF MATERIALS.
Hunt, Robert W. & Co. .....Chicago.
Pittsburg Testing Laboratory Ltd. .....Pittsburg.

TILING, INTERLOCKING RUBBER.
New York Belting & Packing Co. .....New York.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
Allen, John F. .....New York.
Chicago Pneumatic Tool Co.....Chicago.
Watson-Stillman Co. .....New York.

TOOLS, WOOD WORKING.
Atlantic Works, Inc. .....Philadelphia.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co. .....Cleveland.

TOWING COMPANIES.
Donnelly Salvage & Wrecking Co....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.Midland, Ont.

TRAPS, STEAM.
Kieley & Mueller .....New York.
Lunkenheimer Co. ..... Cincinnati.
Sturtevant Co., B F, Jamaica Plain. .....Boston.

TRUCKS.
Boston & Lockport Block Co. .....Boston.

TUBING, SEAMLESS.
Shelby Steel Tube Co. .....Pittsburg, Pa.
Waterbury Brass Co.....New York.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co. .....Boston.
Ashton Valve Co. .....Boston.
Bordo, L. J. .....Philadelphia.
Crane Co. .....Chicago.
Hayden Mfg. Co., N. L. .....Columbus, O.
Jenkins Bros. .....New York.
Kieley & Mueller .....New York.
Lunkenheimer Co. ..... Cincinnati.
Ross Valve Co. .....Troy, N. Y.

VALVES FOR WATER AND GAS.
Ross Valve Co. .....Troy, N. Y.

VARNISHES.
Berry Brothers, Ltd. .....Detroit.
Detroit Varnish Co..... .... Detroit.
Detroit White Lead Works.....Detroit.
New Jersey Zinc Co.....New York.
Also Ship Chandlers.

VESSEL AND FREIGHT AGENTS.
Boland, John J. .....Buffalo.
Brown & Co. .....Buffalo.
Elwell, Jas. W. & Co. .....New York.
Elphicke, C. W. & Co. .....Chicago.
Fleming & Co., P. H. .....Chicago.
Hall & Root .....Buffalo.
Helm & Co., D. T. .....Duluth.
Hawgood & Co., W. A. .....Cleveland.
Holmes, Samuel .....New York.
Hutchinson & Co. .....Cleveland.
King, Rufus S. .....New York.
McCarthy, T. R. .....Montreal.
Newman, R. L. .....New York.
Mitchell & Co. ..... Cleveland
Richardson, W. C. .....Cleveland.
Sullivan, D. & Co. .....Chicago.
Weeks, F. H. .....New York.

VENTILATING APPARATUS FOR SHIPS.
Sturtevant, B. F. Co. .....Boston.

WIRE—BRASS AND COPPER.
Waterbury Brass Co. .....New York.

WIRE ROPE AND WIRE ROPE FITTINGS.
Baker, H. H. & Co. .....Buffalo.
DeGrauw, Aymar & Co. .....New York.
Upson-Walton Co. .....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co. .....Boston.
Ashton Valve Co. .....Boston.
Lunkenheimer Co. ..... Cincinnati.

WHITE METAL—SHEETS, RODS AND WIRE.
Waterbury Brass Co. .....New York.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co. .....Cleveland.
Hyde Windlass Co. .....Bath, Me.
Jenks Ship Building Co. .....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co. .....Bath, Me.

WOOD WORKING MACHINERY.
Atlantic Works, Inc. .....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Midland Towing & Wrecking Co., Ltd..Midland, Ont.

YACHT AND BOAT BUILDERS.
Dreln, Thos. & Son .....Wilmington, Del.
Lane & DeGroot .....Long Island City, N. Y.
Marine Construction & Dry Dock Co.....New York.
Rippley Hardware Co.....Grafton, Ill.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
Warrington Iron Works.....Chicago.
Willard, Chas. P. & Co.....Chicago.

YAWLS.
Dreln, Thos. & Son .....Wilmington, Del.
Lane & DeGroot.....Long Island City, N. Y.

ALPHABETICAL INDEX OF ADVERTISERS IN THE MARINE REVIEW AND MARINE RECORD.

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